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Translation

SOVIET SCIENCE AND TECHNOLOGY POLICY

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24 October 1980

SOVIET SCIENCE AND TECHNOLOGY POLICY

This non-serial report contains selected translations of Russian articles on the planning and administration of Soviet research and development and the introduction of scientific achievements into industry.

CONTENTS

East-West Exchanges Not 'One-Sided', Academicians Claim
(LITERATURNAYA GAZETA, 16, 23 Apr 80)........................... 1

Lavrent'yev, Kolotrykin Defend Scientific Cooperation
Marchuk Defends Siberian Department, Guriy Ivanovich Marchuk Interview

Administrative Pressure Quells Scientific Debate
(G. Cherkashin; LITERATURNAYA GAZETA, No 15, 9 Apr 80) 15

Problems of Prestige and Ethics in Applied Sciences Aired
(M. Vysotskiy; LITERATURNAYA GAZETA, 9 Apr 80)................ 22

Republic Conference on Science and Technology Held in Donetsk
(EKONOMICHESKAYA GAZETA, No 23, Jun 80)....................... 27

New System for Introducing Technology Into Industry
(Kh. Martinson; SOVETSKAYA ESTONIYA, 14 May 80)............... 41

Glebov Stresses Role of Interdepartmental Council in Energy R&D
(A. Travin; LENINGRADSKAYA PRAVDA, 30 May 80)................. 46

Shortage of Technical Specialists Threatens Georgian Industrial Development
(N. Pirtskhalava; ZARYA VOSTOKA, 7 Jun 80).................... 51

Meshkov on VUZ-Industry R&D Cooperation in Belorussia
(N. Meshkov; PROMYSHLENNOST' BELORUSSII, No 4, 1980).......... 55

Improving Cost Accounting in Scientific Research Organizations
(V. Khryapchenkov; PROMYSHLENNOST' BELORUSSII, No 12, 1979).. 64

Georgian AS General Meeting Changes Statute, Elects New Vice-Presidents
(ZARYA VOSTOKA, 13 Apr 80).................................... 68

Armenian Planning Official Suggests R&D 'Coordinating Body'
(G. Khachatryan; KOMMUNIST, 30 Apr 80)........................ 72

Georgian Official on Putting Science Into Production
(I. Gverdtsiteli; KOMMUNISTI, 4 Jun 80)....................... 76

EAST-WEST EXCHANGES NOT "ONE-SIDED", ACADEMICIANS CLAIM

Lavrent'yev, Kolotrykin Defend Scientific Cooperation

Moscow LITERATURNAYA GAZETA in Russian 16 Apr 80 p 11

[Text] Leading figures in science respond to questions in our questionnaire:

1. Using your field of science (technology) as an example, could you illustrate the relationship between the levels attained up to this time by Soviet and world science (technology)?

2. What can you say relative to the contention that Soviet science and technology is "backward"?

3. What, from your viewpoint, is the state of scientific and technical cooperation between the USSR and Western countries? Is it true, as the Western press contends from time to time, that this cooperation benefits only the Soviet Union?

Respondent: Academician Mikhail Alekseyevich Lavrent'yev. Mathematician, author of a large number of works in the fields of theoretical and applied mathematics. Member of the presidium of the USSR Academy of Sciences. Hero of Socialist Labor, winner of the Lenin Prize and two state prizes. Honorary member of the academies of sciences of all countries of the Socialist alliance. Honorary doctor of the academy of sciences of India and bearer of the highest decoration of the French Republic -- the Legion d'Honneur.

1. Strictly speaking, I represent two fields of science. As a student of and successor to Academician N. Luzin, I am a "pure" mathematician. However, for many years I was engaged in a whole host of questions of applied science. I must say that both these directions are marked by a large contribution by Soviet scientists. Moreover, the overall level of world science can be attributed to a large degree to what they have done. For example, the ideas put forth by the school of Academician N. Luzin and the work of his successors -- Academicians P. Aleksandrov, A. Kolmogorov and their students -- to a large extent determined the path for development of whole sectors of mathematics.

We are also pioneers in a whole host of cases related to applied problems. Take the application of the directed explosion. In addition to its theoretical basis, we proposed a number of industrial methods, which included a means of welding by explosion. We are rightfully proud of the tsunami theory, the mathematical models of elemental calamities and other achievements of Soviet mathematicians which have received world attention.

2. I have already spoken of the world accomplishments of our science and technology in those fields that I represent. I might add that, being chairman of the Siberian Department of the USSR Academy of Sciences and meeting with many foreign scientists who represent the most varied spheres of knowledge, I have been convinced many times of their high opinion of the research done by Soviet scientists.

It should also be pointed out that most of our general and specialized scientific journals are promptly translated into the languages of the various countries of the world, including those where science is known to be on firm footing. Naturally, nobody would spend money for translation and publication of works of, as the press labels it, "backwardness."

3. As regards the "one-sided" benefit for the USSR, I admit that I have often noted the opposite. Serving as an example of this are the numerous conferences, symposia and seminars which are held in our country. As a rule, they assemble the most notable representatives of the respective disciplines from all over the world. A large number of our scientific ideas and practical developments are quickly seized upon in the West and many foreign scientists frequently speak of their Soviet colleagues as generators of fresh ideas.

For example, a very representative conference is planned to be held soon in the capital of Kazakhstan. The topic set forth in the agenda is the battle against mud slides -- a very urgent problem for Central Asia. Inasmuch as we have achieved good success in prevention of these terrible slides, a large group of foreign scientists is planning to join us in this conference. We accept this as proper and accuse nobody of being backward.

Scientific cooperation is always mutually beneficial, since it enriches all who take part in the exchange of opinions, ideas and methods of work. Saying that the benefits are one-sided does harm to world science as a whole.

> Respondent: Academician Yakov Mikhailovich Kolotrykin. Specialist in the field of electrochemistry and metal corrosion. Director of the Scientific Research Institute of Physico-Chemistry imeni L.Ya. Karpov. USSR representative to CEMA for the problem of "Development of Measures to Protect Metals from Corrosion." USSR national secretary of the International Electrochemical Society.

1. I am engaged in the study of corrosion damage to metals and electrochemical methods of protecting metals from corrosion. Providing sufficiently eloquent testimony to the importance of this scientific endeavor is the fact that corrosion, by the most modest estimates, "eats up" about one-tenth of the national income of the developed countries every year.

Soviet scientists are devoting primary attention to the electrochemical aspects of the interaction of metals with their environments. I can say with great satisfaction that the Soviet school of electrochemistry and its fundamental research have held and continue to hold leading positions.

In the West they have studied mainly the metallurgical aspects of corrosion. These differences in approach to resolution of a common problem have led to a keen mutual interest on our part and on the part of our foreign colleagues in each other's work in this area. We willingly discuss all results and exchange opinions and experiences. And what has come out of it? Using the theory of electrochemical corrosion, we began to study in more depth the effect of the structure of metals themselves, their purity and impurity on resistance to corrosion. In a short time we were able to somewhat outstrip our foreign colleagues in this area, particularly in the study of corrosion resistance of stainless steel in adverse environments.

Foreign scientists in turn increased their attention to the electrochemical aspects of the problem and, as a result, they also forged ahead.

Such reciprocal "nudging" proved very fruitful and raised the science of corrosion prevention to a new level on a world scale.

2. My foreign colleagues admit that far more favorable conditions for the development of fundamental research exist in the Soviet Union than in their own countries; that our government does not skimp on means, but gives our scientists great opportunities for scientific work. And it is specifically our ideas that often serve as the culture medium for scientific and technical progress.

At the same time, I must express regret that sometimes our ideas and our theory become the property of practice abroad more quickly than they do in our own country. Difficulties with their final development and implementation are explained by our being somewhat behind in production of scientific instruments. But even in this area we have made a large step forward in recent times, showing our capabilities to come up to the world standard.

We ourselves are now fully capable of providing science with many of the most complex modern instruments. However, it is advantageous in this area, more than in any other, to develop international cooperation on a broad scale. With scientific research being conducted such a scale as it is today, it is expensive in the material sense and wasteful in the intellectual sense for each country to conduct research only for itself. Is it worth it to diffuse our efforts?

3. I will give some examples. We have established very close contacts with Japanese scientists in the field of research into metal corrosion. Japanese scientists are showing great interest in our work on the study of the mechanism of diffusion of alloys and the resistance to corrosion of anodic materials. Their research into the corrosion behavior of amorphous alloys has been very useful to us.

We have established bilateral cooperation with British scientists. One of the leading specialists in the field of metal sciences, Professor Parkins, has visited our institute. On invitation from my British colleagues, I gave them a series of lectures last year on corrosion and electrochemistry of alloys.

The story has been much the same with American specialists. They were planning to begin research on the effectof carbide and nitride additives on the corrosion resistance of alloys, particularly stainless steels. But after they had become closely acquainted with our work in this area, they came to the conclusion that we had moved significantly ahead here. Deciding that there was sense in reinventing the wheel, American specialists were compelled to reexamine their plans. Their interest in our work obviously grew after this incident. We mapped out a program for joint research. Coordinators were chosen from both sides. American representatives came to work out agreements for conducting joint seminars and exchanging specialists and lecturers. American scientists have told me that they are counting heavily on active cooperation.

Marchuk Defends Siberian Department

Moscow LITERATURNAYA GAZETA in Russian 23 Apr 80 p 12

[Interview with Guriy Ivanovich Marchuk, conducted by G. Bel'skaya]

[Text] One of the directions taken by the slanderous anti-Soviet campaign, which has been conducted by the reactionary imperialist circles in recent times, is based on attempts to discredit and defame Soviet science and technology. Some organs of bourgeois propaganda are making a desperate effort to convince the public of Western countries that scientific and technical cooperation between the USSR and the West benefits only the Soviet Union. The Soviet Union, they say, is attempting to diminish its "lag" and strengthen its economic and military potential by using achievements in science and technology of the capitalist countries. From time to time one hears calls to limit or even terminate altogether scientific and technical cooperation between East and West, to minimize contacts between Western and Soviet scientists....

More than a year ago LITERATURNAYA GAZETA asked a number of leading figures in Soviet and foreign science and technology to answer the following questions:

1. Using your field of science (technology) as an example, could you illustrate the relationship between the levels attained up to this time by Soviet and world science (technology)?

2. What can you say relative to the contention that Soviet science and technology is "backward"?

3. What, from your viewpoint, is the state of scientific and technical cooperation between the USSR and Western countries. Is it true, as the Western press contends from time to time, that this cooperation benefits only the Soviet Union?

Today, with publication of the interview with Academician G.I. Marchuk, we conclude our series on "The World Level of Soviet Science".

1. On the Leading Sciences

Bel'skaya: Guriy Ivanovich, you have lived and worked in Siberian for many years, as deputy chairman of the presidium of the Siberian Department of the USSR Academy of Sciences and, in recent years, chairman of the presidium. In our conversation for the press ten years ago you spoke of how the foundation of Siberian science was being laid in the young Science City near Novosibirsk. Today it can be said with certainty that this foundation is in place: the Siberian Department is now 23 years old. It has given birth to the Far Eastern branch. Through the academic science of Siberia a solid experience has been gained in resolution of the problems of scientific and technical progress. Many studies conducted by scientists of the Siberian Department of the USSR Academy of Sciences are widely known abroad. Are there achievements among these which occupy a leading place in world science today?

Marchuk: I will probably not err much if I say that in a short time a unique Siberian scientific wonder has sprung up in the eastern portion of our country. The entire country took part in organization of the Siberian Department of the USSR Academy of Sciences. The development of science in Siberia is an example of the vast capabilities of our society and its ability to concentrate its efforts on resolution of critical problems of state-wide importance. In the first decade and a half from formation of the Siberian Department the effects of the science of Siberia were already rapidly spreading from the Urals to the Pacific Ocean. Today the Siberian Department, with the active support of the USSR Academy of Sciences of which it is a constituent part, has entered into the age of maturity. This age is characterized by the scale of its scientific output and the formation of new scientific entities. The success of the Siberian Department is a result of the organization of deep, fundamental research in all areas of the natural and social sciences. Among the large number of scientific studies of scientists of the Siberian Department which are known abroad, there are without doubt those which occupy a leading place in world science.

Perhaps it can be said with all rights that most of the scientific subunits of the Siberian Department have attained the world level in research. Achievement have been made in solid-state physics, high-energy physics, hydrodynamics of vortex currents, catalysis theory, genetics, Earth science, economics, the humanities.... It is simply impossible to list them all. I will treat only some of them in detail. In the Institute of Mathematics outstanding results at the world level have been achieved by the school founded by Academician Anatoliy Ivanovich Mal'tsev. The school has made a large contribution to the problems of modern algebra, logic and modeling theory. Under the leadership of Academician S.A. Sobolev, research has been done in the field of mathematical analysis and a cycle of fundamental projects has been completed on creation of the theory and study of new classes of differential equations. Original mathematical methods have been developed for solving systems of these equations. A number of major results have been achieved in probability theory. And here I must mention the huge contribution to this problem made by corresponding member of the USSR Academy of Sciences A.A. Borovkov. The Institute of Hydrodynamics, under the leadership of corresponding member of the USSR Academy of Sciences A.V. Ovsyannikov, has done research in the field of differential equations and their characteristics. The great applied importance of these studies, as they apply to new classes of problems related to hydrodynamics, can already be foreseen today. On the basis of the proposed algorithms a system of programs has been created to solve a wide range of problems in hydraulics of open waterways and turbine pipes.

In the field of chemical kinetics, a new direction has been opened up and has already undergone development -- the effect of magnetic fields on chemical reactions. Registration of magnetic effects is a unique method of studying the elementary stages of chemical reactions. In the future this method may be used to control such important industrial processes as polymerization and oxidation, separation of isotopes of heavy elements....

Mechanical engineers of the Siberian Department of the USSR Academy of Sciences have achieved major fundamental results in the aerodynamics of aircraft.

On the world level of Earth science, our country today holds the leading position in the study of problems related to volumetric-genetic approach to evaluation of predicted oil and gas reserves. Use of this approach in regional prospecting led to the discovery of oil and gas deposits in the paleozoa of Western Siberia and in the most ancient incrustations of Eastern Siberia. Achievements of our geophysicists today represent new capabilities for determining the material composition of plutonic and mountain rock as well as directed prospecting for hydrocarbon deposits.

These are all scientific achievements at the world level.

In the Yakutsk branch of the Siberian Department of the USSR Academy of Sciences the discovery, by Academician A.A. Trofimuk and corresponding member of the USSR Academy of Sciences N.V. Cherskiy, of the existence of gas hydrates was recorded as a discovery of international significance. In recent years a serious foundation has been laid for the search for a use for gas hydrates. This same institute recently developed the theoretical fundamentals for and conducted a test of a new method for enriching minerals.

Works of Siberian scientists, who created a mathematical model for prediction of the dynamics of a number of species of flora and fauna on specially protected territories, also achieved the world level of science. This was a great contribution to the science of ecology.

Research done by scientists from Yakutsk and Irkutsk in the program "International Studies of the Magnetosphere" was well received in Japan last year at the International Conference on Cosmic Rays. Works published by scientists of the Siberian Department are of high authority abroad. I will cite these examples. In recent years the Siberian Department concluded 13 licensing contracts with firms of the USA, Japan, FRG, Mexico and Bolivia. In 1979 alone contracts were signed for publication abroad of 70 of our scientists' works. A publishing firm in the GDR concluded a contract for the book "Northern Asia: Art and Culture of Siberia and the Far East," which is being prepared by Academician A.P. Okladnikov and scientific workers of the Institute of History, Philology and Philosophy. Scientists of the Siberian Department are preparing a book "The Earliest Stages of Human Settlement in Northeast Asia" for publication by PERGAMON PRESS (Great Britain). ELZEVIR, the largest publishing concern in Holland, has concluded a contract with scientific workers of the Institute of Catalysis. I could give many such examples.

Bel'skaya: Are there basic research studies among those conducted by scientists of the Siberian Department that you would say are bringing about a revolution in their field of science?

Marchuk: Absolutely. For example, a kind of revolution is beginning in chemistry. And a large, fundamental to this explosion has already been made by the chairman of the presidium of the Siberian Department, V.A. Koptyug, and his scientific collective. In world science our scientists are conducting exceptionally important research not only in the field of analysis, but also in synthesis of chemical compounds. It appears that before long a mathematical model will emerge, through the use of which it will be possible to predict the creation of compounds with given properties. This will be the revolution in chemistry for which scientists of the whole world are waiting and working.

I shall name the highest achievements of world science which belong to scientists of the Institute of Cytology and Genetics. They have extracted from bacteria the enzyme which controls synthesis of DNK molecules on matrices of RNK molecules.

A major achievement of the Institute of Cytology and Genetics was the program for domestication of wild animals on the basis of genetic selection. This work, which was carried out under the leadership of Academician D.K. Belayev, will undoubtedly lead to important practical results.

Bel'skaya: Could you name some developments by scientists of the Siberian Department which have led to creation of new divisions or new directions in science?

Marchuk: Absolutely. And they are not few. For example, fundamental research in the field of acoustical electronics and acoustical optics gave birth to a whole host of functional devices of a new type. They make possible composite resolution of problems of microminiaturization of radio sets.

The method for non-standard catalysis, proposed by Siberian chemists under the leadership of Academician G.K. Boreskov, will probably form a new direction in chemistry and become the basis for the chemical industry of the future. This method creates totally unique possibilities for the flow of non-stationary catalyst reactions. It has already been tested in the production of tens and hundreds of tons of chemical products.

A study of weak magnetic interaction between compounds in a chemical reaction, begun by a young scientist, doctor of chemical sciences R.Z. Sagdeyev, appears to be an important new direction in the theory of chemical kinetics.

Still another new sector of chemistry is now being developed by the Institute of Physical and Chemical Foundations for Mineral Processing. Thanks to this new endeavor, which relates to surface activation of reagents, completely new ways are being created to synthesize substances and process them without a catalyst. This is the chemistry of the future! It was born a relatively short time ago. And in international competition Siberian chemists, led by institute director and corresponding member of the USSR Academy of Sciences V.V. Boldyrev, hold important positions in this area.

Two new scientific directions have been charted in the Krasnoyarsk Institute of Physics imeni L.V. Kirenskiy. The first is the physics of magnetic discs and the second is a promising sector of biophysics. Both these directions have already earned recognition not only in our country, but abroad as well.

Very close cooperation among geologists, geophysicists, programmers, technicians and instrument designers led to development of a new direction in geophysical research methods -- vibroscopy of the Earth and volumetric representation of the information. The future of geophysics, especially for Siberia, with its complex tectonic conditions of rock deposits, is specifically linked with this new method. The past five-year plan was the start of a storm in this fundamental problem.

2. Everything for the National Economy

Bel'skaya: Obviously the achievements of Siberian scientists are valued not just for their own sake, but also for the fact that they are making a huge contribution in practice.... During his trip through Siberia and the Far East, L.I. Brezhnev spoke of the important role of Siberia in the development of energy for the country. What part is the Siberian Department playing in the resolution of energy problems?

Marchuk: Today the Siberian Department is taking part in development of a scientific program for a fuel-energy balance in this country before the next century. In the current five-year plan we have created methods and models for long-term prediction and optimization of the fuel-energy complex and its components -- a unified energy system for the country, centralized heat supply and introduction of district heating systems.

Through the use of these models and automated systems a large cycle of research studies has been completed toward development of a long-term program for fuel-energy balance in the country.

Bel'skaya: Could you tell us briefly what contribution scientists of the Siberian Department are making in agriculture?

Marchuk: Very many things are being done here. It would be impossible to list them all. I will cite these examples. Novosibirsk organic chemists, in cooperation with geneticists of the Siberian Department, are doing important work on increasing productivity of agricultural plants by the use of hormones. The scientists have isolated the hormone specimen gibbersib -- a variant of gibberellin -- and studied its efficiency on a number of agricultural crops. In production tests on various crops they increased yields by 20 to 30 percent. The presidium of the USSR Council of Ministers recently examined the question of developing this work and disseminating it in certain regions. As I have mentioned often before, the collective of the Institute of Cytology and Genetics, led by Academician D.K. Belyayev, has achieved major theoretical results in the development of theory and new methods for controlling the formative processes in plants and animals. This promises a broad practical application.

State tests are under way on new types of winter and spring wheat, promising types of feed and grain rye. To satisfy the needs of animal husbandry, scientists of the Siberian Department in cooperation with VASKhNIL [All-Union Academy of Agricultural Sciences imeni Lenin] are working on producing a new variety of crossbred sheep for Siberia. Krasnoyarsk biophysicists have developed technology for deriving artificial feed albumin from inedible products. Tests have shown that the artificial albumin in rations of many types of animals can replace 20 to 50 percent of the norm of animal albumin.

Urgent problems of genetics and hybridization of animals in the interests of animal husbandry will be addressed by the Genetic Center of the Siberian Department of the USSR Academy of Sciences, which has been organized at Gornyy Altay. The most valuable genetic bank of Siberian animals will be concentrated here.

Scientists of the Siberian Department are conducting a cycle of research studies on development of biological methods of combating agricultural and forestry pests. Bacterial and viral compounds have been derived which will protect plants from dangerous pests. Development of these projects will make it possible to substantially limit use of chemical substances which pollute the atmosphere.

Bel'skaya: Several years ago I had occasion to write about original research in the field of holographic memory, which was conducted by the Institute of Automation and Electrometry of the Siberian Department of the USSR Academy of Sciences under the direction of corresponding member of the USSR Academy of Sciences Yu.Ye. Nesterikhin. This institute, one of the first in the country, began studies on methods of creation and technology for maunfacture of optical-electronic information search systems and means for high-efficiency analog-digital processing of information. What is the status of these scientific developments today?

Marchuk: The projects were just beginning then. Now many of the results have already been adopted for use in industrial organization. Fundamental scientific developments of the Institute of Automation and Electrometry are today becoming the basis for wide-scale development of optical-electronic information systems, high-efficiency analog-digital processing and holography.

Bel'skaya: Speaking before workers of scientific and technical journals at the House of Journalists, the president of the USSR Academy of Sciences A.P. Aleksandrov pointed out a shortcoming in modern instrument production. With the science of Siberia developing at such a rapid rate, how do solve the problem of using the newest instruments?

Marchuk: This is one of the most difficult problems, since among the most critical factors supporting accelerated development of basic and applied research is the use of high-efficiency instruments. Conduct of such research requires a high concentration of scientific and technical potential and great material expenditures. With this in mind, presidium of the Siberian Department has organized a number of centers for collective use of unique and expensive equipment. Ten such centers intended for the Siberian Department are now in their formative stage. I will name at least three of the main ones. First, there is the main production computer center of the Siberian Department of the USSR Academy of Sciences. A collective center for processing of aerospace imagery is being created in the Institute of Automation and Electrometry. The third collective-use center -- the center for processing of geophysical information -- is being created in the computer center of the Siberian Department of the USSR Academy of Sciences. This will later become a part of a unified network computer complex.

Bel'skaya: Are scientists of the Siberian Department themselves creating instruments that are not inferior to the best world models?

Marchuk: The Institute of Atmospheric Optics has created instruments for laser diagnostics of the state of the atmosphere, which do not exist anywhere else in our country and are in perhaps only one or two scientific centers in the world. The Institute of Physics imeni L.V. Kirenskiy has created a number of physical instruments and devices on the basis of the use of fine-grain effects of interaction in solids. By parameters, they are superior to any such instruments serially produced in this country or abroad.

Bel'skaya: Could you name at least a few of the more important complex research studies that are directed toward resolution of urgent problems of the national economy?

Marchuk: The activities of many scientific collectives in our department are directed toward resolution of the most pressing problems of the national economy today. I will cite a few examples. The geological institutes are conducting intensive studies of the plutonic structure of the Earth's crust. These studies are directed toward development of a theory of prospecting for deposits that do not emerge to the Earth's surface. Creation of scientific foundations for prediction of earthquakes has become one of the most important directions in geology. Fundamental studies of paleoseismologists, primarily from the Institute of the Earth's Crust, have created a real basis for successful resolution of this problem. A five-year study to evaluate seismic conditions along the BAM [Baikal-Amur Mainline Railway] route was completed last year. Results of these studies are already being widely used today by design and construction organizations of the country.

Our scientists are successfully coping with a problem important to the national economy, related to extraction and transportation of ore at the Noril'sk Metallurgical Combine. I visited the combine last year and saw that recommendations of our scientists are being successfully implemented in practice.

One of the important problems of the national economy -- monitoring the state of the atmosphere -- is being solved through the use of automated systems for long-distance identification of concentrations of gas and aerosol components of the atmosphere. These systems were created by the Atmospheric Optics Institute. These studies are being conducted in close cooperation with Bulgarian scientists. Fundamental research on experimental mineralogyallowed the scientific collective of the Institute of Geology and Geophysics to expand their work on synthesis of minerals that are important to the national economy. Methods developed for producing emerald and opal are being introduced in a number of the country's enterprises.

Fundamental research on the mechanism of formation and principles of movement of vortex rings, conducted by the scientific collective of the Institute of Hydrodynamics, found direct and highly effective application in the oil industry. The scientists proposed ways to extinguish oil well fires by the use of vortex rings.

In response to specific recommendations made by the 25th CPSU Congress, workers of the Institute of Semiconductor Physics decisively switched their research to new principles -- electronic optics, integrated optics and acoustical optics. Today some of these decisions have already been adopted by industry and on their basis a new generation of electronic instruments is being created.

Some fundamental research studies by the Institute of Thermophysics created the basis for new large-scale technological processes. The Institute of Theoretical and Applied Mechanics succeeded in making a large step in the application of fundamental results to resolution of practical problems in creating models of new equipment.

Theoretical experimental studies of the problem of the tension-deformed state and dynamic disintegration of solids, which were conducted by the Institute of Mining, made it possible to create a model of a mine detonation and the focus of an earthquake. Results derived on the mechanics of deformed rock and friable materials have already found wide application in optimization of technological processes in mining, powder metallurgy and the chemical industry. A series of scientific studies conducted in this institute led to creation and production implementation of new technology for enrichment of minerals.

Bel'skaya: I sense that all aspects of scientific life in the Siberian Department are dear to you. But is there one among them, Guriy Ivanovich, that is closer to you than the rest?

Marchuk: There is. And, I admit to you, I am truly enthralled by this grandiose idea, which embodied one of the greatest achievements of the Siberian Department and essentially determined the place held by Siberian science in the system of the USSR Academy of Sciences. This is the "Siberia" program -- a significant event in the scientific life of the Siberian Department.

"Siberia" is a long-term, large-scale integrated program targeted on resolution of scientific, technical and regional problems for development of the productive capacities of Siberia. It will solve the problem of the composite and efficient use of the natural riches of Siberia, Yakutiya and Transbaykal. The "Siberia" program was born in the course of fulfillment of the CPSU Central Committee's resolution on activities of the Siberian Department and realization of the proposals made by Leonid Il'ich Brzhnev during his trip through Siberia and the Far East.

Development of the long-term, large scale "Siberia" program is an important step in realizing a strategic line for transition to the program-goal principle of organization of planning and financing of scientific research and its use in the national economy.

Bel'skaya: At the opening of the recent March session of the general assembly of the USSR Academy of Sciences, Academy president A.P. Aleksandrov cited the "Siberia" program as one of the best, broad-scale, regional programs, in which participation by academic science is concentrated on scientific and technical progress. Two years have gone by since "Siberia" was approved by the general assembly of the Siberian Department of the USSR Academy of Sciences. Is this program already having a real effect on the national economy, or is two years too short a period to ask such a question?

Marchuk: Even in such a short time as two years there have been real acheivements. The program has been firmly established as the priority complex of fundamental and applied research for the entire Siberian Department. Thanks to this program, the main scientific directions and problems of each region encompassed by the "Siberia" program have been defined and specified to the maximum extent.

As regards real effect, USSR Gosplan recently examined the development of 20 of the major scientific directions of Siberian Science. The national economic effect of only six of these projects amounts to about two billion rubles.

Through the "Siberia" program the Siberian Department of the USSR Academy of Sciences has taken a new step along the path toward strengthening the relationship between science and the national economy. The principle of "get it out to the branch of industry" has been developed into getting the achievements out to inter-branch complexes.

Bel'skaya: Guriy Ivanovich, what key problems does the Siberian Department plan to examine in the 11th and 12th Five-Year Plans?

Marchuk: A significant part of the fundamental and applied research done by the Siberian Department during the new five-year plans will concentrate on the key problems of utilization of natural resources and development of the productive capacities of Siberia. Scientific prediction will change the map of this immense region. The main goal of the scientists of the Siberian Department of the USSR Academy of Sciences is to turn our research quests to the most urgent and promising directions in science.

The resources of Siberia today determine the future development of our whole country. Therefore, the development of research for resolution of the complex problems of Siberia is a first-priority task of state-wide importance.

12184
CSO: 1861

ADMINISTRATIVE PRESSURE QUELLS SCIENTIFIC DEBATE

Moscow LITERATURNAYA GAZETA in Russian No 15, 9 Apr 80 p 11

[Article by Gennadiy Cherkashin, candidate of physicomathematical sciences, in the column, "A Writer's Notes": "The Worth of One Discussion"]

> [Text] In science, debate is a normal occurence without which science could not exist. In those cases when attempts are made to substitute administrative pressure on one of the sides in the debate for the free exchange of opinion, the business sometimes turns into an appreciable loss both for science and for society on the whole. These notes of a Leningrad writer, Candidate of Physicomathematical Sciences G. Cherkashin, deal with this fact.

For laboratory workers, this story began with a scientific seminar on 22 November 1974, when Doctor of Chemical Sciences Ol'ga Vasil'yevna Oshurkova addressed her colleague, Doctor of Physicomathematical Sciences V. Troshin, by uttering this phrase: "According to our data, Viktor Prokof'yevich, the so-called 'true migration rates' are not entered into the ion-distribution scheme, in particular for magnesium and lithium."

For me this story began with a letter which arrived at our editorial office on 14 March 1979. In the letter, signed by senior science-staff member O. Oshurkova and junior science-staff member A. Gorshkov, it said that at a laboratory seminar they directed their attention to a number of contradictions of a theoretical nature in V. Troshin's method. Instead of opening a scientific debate, laboratory director G. Ryskin began to pressure them along administrative lines.

"We have repeatedle addressed the institute with a request to decide the scientific debate or at least to create the conditions for a solution," goes the letter. "However, for some reason or another, the administration considered this awkward. Then things began to happen. We are systematically deprived of our annual bonuses; we are denied representation in reelections to our working posts; and we are required to resign from the laboratory. Finally, on 28 February of this year, a decision to fire us was adopted by a majority vote at a session of the laboratory council. No reasonable argument was given."

"I was presented with the choice: either let them have their way with Troshin and all his work or become a hero in his defense." These words were spoken by laboratory director Grigoriy Yakovlevich Ryskin, an elegantly dressed man of medium height. "They had no viewpoint at all. All of their refutations stemmed either from a misapprehension of the question itself or from a simple misrepresentation of the facts. It is my opinion that they were not interested in the truth but were interested in only one thing: disproving Troshin at any cost, no matter what would happen."

Troshin sat in on our discussion and never interrupted his director. His face showed puzzlement and hurt, and this is understandable. Since 1974, you know, he has had to defend himself from the attacks of his colleagues.

Nevertheless, I was not able to accept Ryskin's words as truth without finding out what had motivated Oshurkova and Gorshkov, made them struggle, go against the grain and exhibit such stubbornness. What had done it? What facet of their personalities? Was it a personal hostility toward Troshin or envy at his success?

In answer to my question Grigoriy Yakovlevich made a helpless gesture. "Speaking about Gorshkov, it is possible that his problem is that he has not yet defended his dissertation. Nevertheless, I treated him well as long as he did not interfere in the discussion and did not look for faults in Troshin's method. Previously he had not occupied himself with these questions. After that seminar, however, he made an unwarranted switch to this subject."

"Therefore," I said, trying to be more accurate, "Gorshkov's conscience made him take up these questions?"

"One might say that," said Grigoriy Yakovlevich, shrugging his shoulders. "I will now cite you an example which characterizes Gorshkov eloquently. Viktor Prokof'yevich had a competitor. Her dissertation, which, naturally, relied upon Troshin's method, had already been written. The place for the defense of her dissertation had already been chosen when the attacks on the method began. Gorshkov announced that he was going to state his claims to the academic council. I asked him not to write the council. He promised and, in actuality, did not write to the academic council. He did, however, write to her opponents! Really, is that the way decent people act?"

"As far as my relationship with Ol'ga Vasil'yevna is concerned," he continued, "the only dissent we have had here in 20 years has been just recently. When it came time for her to be re-elected to the post of senior science-staff member , I submitted a report to the director in which all of Ol'ga Vasil'yevna's previous services were listed. However, since the questions that she had been dealing with, in point of fact, had already been settled, I considered it inexpedient to re-elect her for the next five years. Generally speaking, in my opinion, it was because the question had been settled that she attacked Troshin and worked for several years trying to dig up shorcomings in his work. It was in this, however, that she and Gorshkov suffered a total, crushing defeat."

"How did this manifest itself?" I asked interestedly.

"At first they wished to dispute Troshin theoretically. Nothing came from it. Then they wrote a note to the problem-review board, stating that they had experimentally obtained results that contradicted Troshin's. Troshin demanded that a commission be formed. In the presence of the commission they obtained on their equipment entirely different results from those that they had presented to the problem-review board and, vice-versa, Troshin's results were confirmed."

"Yes," said Troshin, "we have the commission's report, and you may make certain of everything yourself."

I opened my document case and put in all the documents I received from Ryskin and Troshin.

In the documents they produced, the reasons for the dismissal were drawn up with the severity of a medical diagnosis: "in order to sanitize the atmosphere in the laboratory."

Sports judges cannot drive in goals like Pele, shoot pucks like Kharlamov, lift weights like Alekseyev nor skate across the ice like Rodnina and Zaytsev, but no one demands it of them. Their job is to see that the rules of competition are observed. Besides the beauty of the movement, they must also declare misses, incomplete plays and carelessness in execution.

Were the rules of scientific discussion observed in the given case? Also, did the discussion always center on Troshin's method?

Laboratory director G. Ryskin believes that the discussion was conducted according to all the rules and that it ended in "total, crushing defeat" for Oshurkova and Gorshkov.

However, studying the documents presented by this side and that, I unintentionally directed my attention to that consistency which they revealed. I was frankly astonished, for example, by the fact that more than a year separated the submission date of Oshurkova and Gorshkov's report that Ryskin had mentioned and the time of the laboratory commissions's paper on the verification of their experiments!

I was also disturbed by the fact that even though the commission revealed the same qualitative behavior as in Troshin's work, the quantitative results nevertheless differed considerably. This fact could not but be noticed, and, finding themselves in a rather awkward position, the members of the commission found nothing better to write than: "A complete explanation of the reasons for these discrepencies can be found if one provides for a systematic organization of experiments that would deviate from the tasks set before this commission."

The question automatically arises: why, when they had already encountered the necessity of setting up experiments to ascertain the truth, did the laboratory staff not insist on carrying out this work? In fact, in the given case, it is clear even to the non-specialist that if the results of the experiments depend so strongly upon the conditions under which the experiment is carried out, then the values for the "true migration rates" which Troshin introduced into the solution chemistry would always be subject to doubt.

During this case there also appeared a scientific report by Gorshkov, "On the Contradictions in the Troshin Method," written with winning logic and argumentation. This report was first sent to Troshin, but I did not find a reply to it that was as convincing and as well-reasoned.

Ryskin's assertion that "in the past three years Oshurkova has not submitted a single paper to the press" also turned out to be false. After the scientific seminar her article was sent to the editorial board of the journal ELEKTROKHIMIYA, but then--in an unprecedented move--Ryskin immediately fired off a letter to the editorial board, stating that "the article in question is totally in error and, moreover, is distinguished by its inferior scientific level. In light of this fact, the publication of the given article in your journal would be inexpedient." This letter played its role, and the article did indeed remain in the journal's editorial office for about three years. In December of last year, however, it was published all the same. The journal's staff workers had come to understand it.

Unfortunately, one could cite many such examples--examples which prove that laboratory director G. Ryskin did everything within his power to prevent an open discussion.

During one of my meetings with Andrey Ivanovich Gorshkov, I asked why he had written to his competitor's opponents. Was this a comradely way to act? My question did not disturb him. "What do you mean 'comradely'?" he replied. I had serious doubts as to the correctness of the method. Assume that there is an erroneous postulate at the basis of the method. The error will then be published and will be incorporated into the body of a new scientific structure. Can one be aware of such a thing and remain silent" The defense of a dissertation is the defense of a selected trend in science, the method and the results achieved. Let my doubts be refuted, I thought, if there is no truth in them."

It is difficult to take exception to such logic.

Ye. Kaymakov, a former staff member in that laboratory (Troshin, incidentally, often refers to his work) provided this description of Gorshkov's personality:

"he is a man of scrupulous honesty. He rejects compromise. This trait of his was highly valued by Academician Boris Pavlovich Konstantinov. Therefore, he entrusted Gorshkov with the most important and precise experiments. This does not mean, of course, that he never made mistakes. There probably are no such people. At times he is undone because of his passion, but, once he figures things out, he always admits his errors. If he is certain of his correctness, there is no scientific authority that can sway him."

The new experiments which have just been set up jointly by Gorshkov and the director of the group, Candidate of Sciences Yu. Stepanov, shed additional light of the processes taking place in the solutions. The interpretation that they have suggested, in their opinion, disproves the postulate which lies at the basis of Troshin's method. Nevertheless, the question of where the scientific truth lies has not been solved definitively. If one assumes that Troshin is correct, then any reasonable criticism that aids in exposing the weak and doubtful areas can only work in favor of his method. If his opponents prove to be correct, then, in that case, his method would have played a positive role all the same, since it would have provided the impetus toward the further creative development of the subject.

However, no matter how long and difficult the road to truth, it triumphs all the same. If a different sort of creative atmosphere had reigned in the laboratory, it is likely that all the points in question would have been resolved in a manner that was not so painful.

It remains to be seen what is hidden behind the words of G. Ryskin when he says that the question which O. Oshurkova was dealing with "has in fact been settled."

I will cite two documents which arrived almost simultaneously. They were addressed to Academician of the USSR Academy of Sciences V. Tuchkevich, director of the Institute of Applied Physics imeni A. F. Ioffe.

"Most Honored Vladimir Maksimovich!

At your institute, Academician B. P. Konstantinov and Doctor of Chemical Sciences O. V. Oshurkova have developed a method of capillary isotachic-line phoresis which is widely known in our country and abroad. The pioneering experiments of O. V. Oshurkova as well as a number of foreign studies have shown that capillary isotachic-line phoresis can be utilized effectively in analytical and preparatory separation of compound peptide and protein mixtures. The development of these trends in science demands a considerable intensification of the work in capillary isotachic-line phoresis at your institute. In light of this fact, I would ask you to show the necessary cooperation with O. V. Oshurkova in her studies of capillary isotachic-line phoresis.

Director of the Interdepartmental Scientific-Technical Council on the Problems of Molecular Biology and Molecular Genetics, Academician Yu. A. Ovchinnikov

23 February 1976"

Here is a summary from G. Ryskin's report, submitted to the board on 4 November 1976:

"Considering the scientific disagreement between O. V. Oshurkova and myself on questions dealing with evaluating the prospects of capillary isotachic-line phoresis and disagreement on the question of the necessity of expanding the work on this method and, moreover, taking into account the inexpediency, in my opinion, of manufacturing a series of IS-5501 instruments which O. V. Oshurkova has praised, I consider it impossible to sign her application for confirmation to the post of senior science-staff member for the next five years, for this would signify my approval of her past and future scientific and commercial activities for which I consider it impossible to bear responsibility."

Thus, we have two opinions on isotachic-line phoresis, the scientific trend developed by Academician B. Konstantinov and his student, O. Oshurkova. Unaware of the strict sentence passed on this trend by laboratory director G. Ryskin, the chairman of the scientific council for analytical chemistry of the USSR Academy of Sciences, Academician I. Alimarin, and his deputy, member-correspondent of the USSR Academy of Sciences Yu. Zolotov, continue to petition for an expansion of these studies. The Berezniki affiliate of the All-Union Scientific Research and Design Institute of the Aluminum, Magnesium and Electrode Industry is studying the feasibility of utilizing this method for the rapid analysis of electrolytes and is coming to a conclusion on the future prospects, universality and expediency of introducing capillary isotachic-line phoresis into practice at plant laboratories in the nonferrous metallurgy and potassium industries as well as in other related industries.

Capillary isotachic-line phoresis received a good evaluation as early as March of 1973 at the All-Union Conference on Progressive Methods of Rapid Analysis in Nonferrous Metallurgy. G. Ryskin was well-informed of this--in the capacity of addressee his name appeared on a letter which Academician A. Prokhorov sent to the institute. The new prospects for the application of this method in industry were revealed in this document.

In a letter which arrived from the Ural'sk All-Union Scientific Research and Design Institute of Halurgy, one may read:

"This affiliate is conducting research into the application of the capillary isotachic-line phoresis method developed at the USSR Academy of Sciences' Institute of Applied Physics by Academician B. P. Konstantinov and Doctor of Chemical Sciences O. V. Oshurkova. We wish to apply the method in the analysis of the products of the potassium industry. Assuming that the academic institute is interested in the broad application of the results of the investigation and relying on your urgent assistance to an applied-science institute, this affiliate sees the necessity of addressing you for the THIRD TIME [author's capitalization] with a request to extend the contract. We have received no answer to our letters of 22 June and 12 August 1976.

Ryskin's resolution was based on this letter: "I consider it sufficient to organize consultations, etc."

To set forth such a resolution or not to answer the letter at all would, of course, be much simpler than looking right into the eyes of a person who, not knowing of the sentence that had been passed, continued to bombard the institute with letters. You could tell these people that the method is unpromising. They, naive people that they are, would start to object and would recall that in 1974 Ol'ga Vasil'yevna Oshurkova's work in capillary isotachic-line phoresis was noted with a bonus from the presidium of the USSR Academy of Sciences; that in the same year her priority was recognized at an international symposium; and that in the competition of the All-Union Chemical Society imeni D. I. Mendeleyev her papers on capillary isotachic-line phoresis and the coulomb phoresis method were awarded medals and bonuses. You would admit frankly that you did not wish to be responsible for her previous work. In reply, they would begin to say that the followers of Oshurkova could be found the world over: in 1976 alone 144 scientists published their papers and 197 did so the following year. They would start to refer to large international congresses devoted to capillary isotachic-line phoresis and would assert that the very fact that the conferences were called testifies to the pressing nature of the problem. But no, it is better to stick to the shadows and quietly but firmly pursue a course of enduring those who would rock the boat. For a start, you could not rerecommend Oshurkova and, later, even try to have her fired. So there would not be too much of a fuss, you could stop all development of the instruments in the laboratory.

As it turned out, the interested organizations today can pay foreign firms to acquire fine instruments that operate on the principle of capillary isotachic-line phoresis. The instruments make it possible to conduct quickly and reliably the analysis of complex chemical, protein, peptide and other compounds and solutions.

The most recent achievements in this area could be seen at an exhibit, "Instruments and Reagents in Chemistry," which was put on in Leningrad from 25 to 28 September 1979. Foreign scientists spoke about the fact that all studies worldwide began with the article by B. Konstantinov and O. Oshurkova, not knowing that the young woman in glasses sitting in the hall was Ol'ga Vasil'yevna Oshurkova herself. It is possible that under different circumstances Ol'ga Vasil'yevna would introduce herself to her colleagues. In the given case, however, what could she reply to their questions? She could tell them how she had been refused the position of senior science-staff member, or how the laboratory council had decided to dismiss her. She would not have been able to explain, no matter how she would have tried, why work on developing such instruments, necessary for science and the economy, had been curtailed.

9512
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PROBLEMS OF PRESTIGE AND ETHICS IN APPLIED SCIENCES AIRED

Moscow LITERATURNAYA GAZETA in Russian 9 Apr 80 p 11

[Article by M. Vysotskiy, candidate of technical sciences: "In Order to Avoid the Unpleasant"]

> [Text] We continue our discussion of the applied sciences' effectiveness [LITERATURNAYA GAZETA No's 3, 7, 11].
>
> If a specialist is lacking in a quality such as a businesslike attitude, he usually avoids the applied science questions and gravitates towards research of a theoretical nature. What happens, however, if he has an overabundance of that attitude? The author of today's article raises the question of the relationship between the scientific ethic and the prestige of the applied science field.
>
> We will also print the usual selection of letters regarding this discussion.

It is only from a distance that science appears to be a monolith whose crystalline structure is composed of scientists who, in the opinion of one group of people, are seeking truth. In the opinion of some others, these scientists seek profit, while there are still others who believe that these scientists seek a conveniently opportune hybrid of profit and truth. From within and even up close, science is multicolored, multifaceted and, most important, hierarchical.

I am reminded of one bright Turkmen graduate student who gleefully depicted the way her grandmother came out of her yurt (which detail remains on the teller's conscience) in order to meet the husband of one of her granddaughters. He had come from the city, and the grandmother keenly scrutinized the overdressed fellow.

"Are you a candidate?" she inquired.

"Yes, yes, I am a candidate, grandmother. The vote was unanimous, only one abstention," said the grandson, reassuring the old woman.

"A candidate of technical sciences?"

"Of what? No need to worry, grandmother. I am a candidate of technical sciences," he said.

"It would be better if you were a candidate of physical sciences. Very well, then. Live in peace, and may Allah provide you with your doctorate."

Why does common talk place the physicist a cut above the engineer? We will wait with our answer. It would be better if we first took a look into any one of the fields--mechanics, let us say.

At the top of the prestige ladder are the elect who dream of discovering the eternal laws. Only occasionally do they descend from the academic spheres and acquaint themselves with industrial problems. Some of these "academists" risk being transferred (with a raise, of course) into the applied science sector. In the depths of their souls they consider themselves to be unfortunates and immediately begin to turn their own laboratories (section, institute) onto the academic track. They and the applied scientists who have gone astray use various dressings to shove academic garnish into the dishes prepared in their scientific kitchen while restricting the topics of applied science.

What is it that inexorably draws scientists into areas that do not call for an immediate result? Why do the most mundane, basic problems acquire lofty connections, avoid the demands of practical application and take flight for the broad expanses beyond the clouds?

One of the reasons is the unavoidable difficulty associated with introducing solutions to practical problems. It is much more pleasant to conclude one's scientific paper by sending an article to a reputable journal and then signing the satisfyingly crisp reprints than it is to tame the bucking forces of industry, to strike up and maintain contacts with experienced workers and to produce rigid economy. Forget those awards that will have to be shared with someone else! It is this that many see as the reason for science creeping inexorably into the comfortable lap of academe. I, however, see the chief reason in something else.

Every now and then pseudo-scientific figures appear on the pages of the press. Sometimes it is a television expert who has become a professor of radio engineering, or an accountant who, through selection, nearly got into the All-Union Order of Lenin Academy of Agricultural Sciences imeni V. I. Lenin--various people, certainly capable of doing something. Can an evident tendency toward the applied sciences be seen, however, at the center of such stories? As a rule, these people capitalize on the particular current interest in a subject and use the novelty of a problem as their trump card. These problems are such that even recognized scientists are unable to comprehend them. In other words, it is in the applied sciences that the scoundrel has a free hand. There are in academic circles, of course, people with varying degrees of talent, but there are no ignoramuses: their very first paper at a scientists' conference would expose them; the auditorium floor would burn beneath their feet. Things are clear in academic science, while in applied science, where there is no stable scientific community and the science itself is all the more novel, it is frequently very difficult to draw the line between the genius and the windbag. Only history may judge them, but first they have to go down in history.

It is the ethical aspect that keeps many talented scientists from sinking into the depths of practice. It is for this reason that the best method of solving the problem, even if only partially, is to improve the ethical climate of applied science, to speak more boldly about its shortcomings and to return to the competition the edge that has been lost.

No material compensation can make up for the fact that, as was correctly noted by Professor V. Markomov (LITERATURNAYA GAZETA No 11), there are many more coauthors for a single article in the applied sciences than in the basic sciences. Although this numerical indicator is an indirect one, it is apparent testimony to the level of the scientific ethic. Alas, the phenomenon that was the theme of S. Mikhalkhov's famous play, "Pena" [Foam], and later of the film with the same name is still widespread. True, there is one embellishment in this witty play: for the sake of science the administrator lays out cash for a dissertation, using his own hard-earned rubles. This is not the worst that could have happened. It is worse when payment for the dissertation comes out of the State's pocket.

If, for example, the director's certifying work is in fact written by the entire scientific research institute, then, from the legal point of view, things are just fine: the director's name appears in all reports, most often in the mythical role of "scientific project director." I do not contend that such a process of scientific creation is the exclusive prerogative of the applied sciences, but the predominance of the applied sciences in its development is unquestionable. Is it any wonder, then, that the bright young author of a short paragraph in such a collective work, having received his share (a master's degree), would forever be filled with hostility toward the applied sciences?

The problem of the prestige lag in applied science has a multitude of faces. Here is one of them. A scientist from a peripheral applied science university presents an abstruse theory. His brother applied scientist cannot figure it out—the theory is all wrapped up in terribly intricate integrals. The author of the paper uses scientific jargon. From the looks of the paper, even Einstein would not be able to make it out. True, there are in academic circles those who could tell immediately that the author belonged in a program for the elimination of illiteracy in mathematics. They would easily make out the errors in logic and would notice where the ends of the references in the literature were hidden. They could also tell when things were deliberately obscured. Here is the problem, though: such a person would not look into the work of the applied scientist. He would give up, saying, "For God's sake, don't get me mixed up in this!" Representatives of the basic sciences possess a particular trait--they are finicky, are they not? He says, "I am not an investigator, but a scientist. Let the Section for the Campaign Against Embezzlement of Socialist Property deal with forgeries." The representatives of the basic sciences could be of great use, in fact, in such a detective case--in the role of experts.

Meanwhile, fellow applied scientists, captivated by the irreproachable, decorative side of the work and the high administrative dignity of its author, begin to extol him and to award the bonuses. If a similar theory were to appear on the academic stage, its day would be short. In the applied science camp, however, it is capable, without offending anyone, of lasting a decade if, of course, the author does not run up against an apparent authority who possesses power.

This is what happens when mediocre applied scientists, instead of modestly filling their own field, stubbornly pull on their academic gowns. The applied scientist himself is a fat squab, while the gown is made for a slender giant. The ravelling seams go to pieces, and the floor gets swept. A young researcher who has examined a similar story will henceforth prefer to "avoid the unpleasant" and, when the opportunity presents itself, will slip into the academic sphere where similar "naked emperors" are much less common.

The specialist encounters the scientific hierarchy early on, while he is still in the university. The applied science lecturers, on the whole, mumble despondently from their crib sheets. The representatives of the classical sciences are like artists, however: their hands know no notes, their tongues make no slips. These lecturers entice the most gifted listeners who are not yet able to separate the essence of science from its personification in the lecturer. For this reason, from the very beginning of some forging process, one has to be satisfied with the human material that has been rejected by theoretical electrical engineering or theoretical mechanics. The brightest minds are infected with a scientific snobism and a prideful sense of belonging to the scientific elite.

There is no monetary enticement that can lure such a person into practice. He is above material gain and is capable of spending his entire life at his modest position, sweating over some abstract theoretical problem in which only two people in the whole world can see the sense--our hero and one Belgian. These two, in fact, maintain a lifelong acquaintance only with one another, although it is by means of limited-circulation journals. One wag has suggested that such scientists should begin their article with the words, "Dear George!" or "Mon Cher Ivan," since it is a personal matter between the authors. "Well, alright," you say, "whom does it hurt?" First and foremost, it is bad for the forest. Each number of the journal uses up almost a half hectare of forest. Thus, it would be much more sensible if these two representatives of "pure" science would correspond with one another by mail.

There is, however, something much worse: the position in the world of applied sciences that has been prepared for the above-mentioned Ivan was occupied by Petr. Of all the qualities possessed by a scientist, Petr has only one--ambition. All the troubles began when Ivan, a student from a technical university, began staring dumbfoundedly into the mathematics lecturer's mouth as if bewitched.

In no way does this mean that all basic research is vain and useless. Rather, it is a question only of the loss of sensible proportion between the academic and applied fields. As long as the applied disciplines humbly satisfy the lowest step in the scientific hierarchy and, finally, as long as the hierarchy itself lives on, their prestige cannot be raised.

The troubles in applied science are closely interwoven with a multitude of problems. To propose a simple solution for them would take a mixture of naivety and cynicism. The solution can be seen in a broad discussion of all the urgent problems.

9512
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REPUBLIC CONFERENCE ON SCIENCE AND TECHNOLOGY HELD IN DONETSK

Moscow EKONOMICHESKAYA GAZETA in Russian No 23, Jun 80 pp 1-7 (Supplement)

[Selected articles from the supplement "Library of Advanced Experience": "Scientific and Technical Progress and the Economic Mechanism: Materials from the Donetsk Conference on Science and Practice"]

[Text] Among the chief trends of present-day economic policy, the 25th CPSU Congress gave emphasis to the hastening of scientific-technical progress and determined basic ways for solving this urgent and responsible task. In a report by L. I. Brezhnev at the party congress, it was stated: "The revolution in science and technology requires cardinal changes in the style and methods of economic activity, decisive struggle against stagnation and rigidity, underlying respect for science, the knowledge and desire to accept advice and to consult with science. It requires improvement in planning and economic stimulation to create conditions that will make possible the most rapid progress of new ideas through all stages of development--from discovery to mass production--and will put a reliable economic damper on the output of outdated products."

A large and interesting body of experience in the management of scientific-technical progress has been accumulated during the years of the Tenth Five-year Plan at enterprises of the Ukrainian SSR.

During the four years of the five-year plan, more complex-mechanized and automated enterprises, shops, and sections, and mechanized and automated production lines were put into operation in the republic than were designated by the plan. The economic effect of introducing new technology at enterprises of the Ukraine exceeded 3.2 billion rubles.

In the final year of the five-year plan, 1650 complex-mechanized and automated enterprises, shops, and sections, and 2670 mechanized and automated production lines will become operational. Seventy-five thousand workers will transfer from manual to mechanized labor.

The efforts of scientific institutions, planning and design organizations of the Ukraine in 1980 are fulfilling more than a thousand scientific and technical tasks, will develop 800 models of new types of machines, equipment, devices, and instruments and equipment for automation, and about 300 progressive technological processes and materials.

A number of new forms and methods for hastening scientific-technical progress are found and introduced into practice by advanced collective of Donetskaya Oblast. As was noted in an article by the first secretary of the party obkom B. V. Kachura, "United with Science," printed in the first issue of EKONOMICHESKAYA GAZETA for this year, the number of agreements for creative cooperation by scientific institutions with enterprises and organizations has grown by a factor of 1.4 since the beginning of the five-year plan.

During the past year an agreement was concluded for scientific and technical collaboration by the Ukrainian Academy of Sciences with enterprises and organizations of the Donbass. In fulfilling the agreement, academy institutes have expanded fundamental research on problems of mining sciences, new construction materials with predetermined properties, and other trends. For their part, Donbass enterprises and organizations are creating the conditions necessary for successful fulfillment of joint research and are facilitating the most rapid introduction of scientific results into practice.

In the Donbass as in other regions of the Ukraine, a number of scientific-production associations have been organized which, in combination, are solving the tasks of development and assimilation of new technology. In recent times, the forms for tying science with practice and for raising the effectiveness of scientific research have become richer and more varied. Among them are complex scientific and technical goal-programs and creative cooperation on the basis of comprehensive agreements on the pattern "science-design-production."

Questions on generalizing accumulated experience and further hastening scientific-technical progress in the light of the decisions of the party and government on further improving the economic mechanism, were examined recently at a republic conference on science and practice at Donetsk.

The conference was organized by the Donetskaya obkom of the Ukrainian Communist Party, the Academy of Social Sciences of the CPSU Central Committee, the Ukrainian Academy of Sciences, Ukrainian Gosplan, the Ukrainian Republic Council of Scientific and Technical Societies, and the editors of EKONOMICHESKAYA GAZETA. Participating in its work were party, soviet, and Komsomol workers, associates of scientific institutions, VUZ faculty members, and managers and specialists from branches of the economy and from planning and design organizations. The present articles were prepared on the basis of materials from this conference.

TOWARD HIGH EFFECTIVENESS

"Four years ago, in the spring of 1976," remembered Secretary G. P. Yerkhov of the Donetskaya obkom of the party, in his report, "here in Donetsk a republic conference on science and practice took place which was devoted to social-economic problems of hastening scientific and technical progress in light of the decisions of the 25th CPSU Congress. Now has come the time to sum up the results of the work done, to analyze the successes and shortcomings, and also to determine ways to develop it further."

The Donetskaya obkom of the party and all party organizations are now more purposefully and concretely engaged in questions of scientific and technical progress. In our field of vision there are scientific developments of applied and fundamental character, planning-design activity, the creative work of inventors and rationalizers, the introduction of advanced experience into practice, various forms of mass participation by workers in the management of production, socialist competition, and valuable initiatives and innovations.

In fulfilling the recommendations of the previous conference, the Donetsk Scientific Center of the Ukrainian Academy of Sciences developed a complex regional program of research on improving the system of territorial control over the scientific-technical process. This program is in complete harmony with the "Complex Plan for Scientific and Technical Progress in Industry of Donetskaya Oblast for 1976-1980." Its composition cut across fourteen branches of the economy in the oblast by city and rayon and took into consideration the five-year plans of academy and nonacademy scientific-research institutes.

As is known, in party and government measures for improving the economic mechanism, high-level significance is attached to fulfillment of the scientific and technical program for development, assimilation, and introduction into production of new highly effective technological processes and products. In this connection, the party obkom has examined the question of developing a "Complex Program for Scientific and Technical Progress and Its Socio-economic Consequences for the Economy of Donetskaya Oblast through the Year 2000." This will require significant effort on the part of scientific, party, soviet, and production workers. But there is a good basis for thinking that the established goal will be achieved.

RELYING ON ACCUMULATED EXPERIENCE

We rely on the accumulated experience of party management of scientific-technical progress and coordination of the activity of scientific and production collectives. One of the forms of such management consists of councils for cooperation to raise the effectiveness of production. They are working productively both at the obkom level and also at the gorkom and raykom levels of the party. On the initiative of the councils for cooperation at practically all enterprises, complex plans have been developed for scientific-technical progress, and long-range plans have been developed for raising the technical level and quality of products being turned out.

The oblast party organization continuously keeps the activity of scientific and planning-design institutions within its field of vision. Academy institutions since the beginning of the Tenth Five-year Plan have increased the volume of work done under economic agreements by a factor of 1.7. In VUZ's, elements of program-goal planning of research are being applied in an increasingly large scale. The quantity of important developments done according to coordinated national and republic plans has doubled. Scientific-research institutes of branches of the economy have energetically striven to introduce into production developments which were completed in previous years but remained, as it is said, on the shelf, finding no practical application.

The role of agreements for creative cooperation should be singled out in particular. In the current year, 864 agreements have been made by scientific institutions and industrial enterprises and organizations of Donetskaya Oblast. And here it should be stressed that in recent times these agreements have been more and more focussed on the solution of complex tasks rather than only on uncoordinated separate topics as often happened in the past.

The bureau of the party obkom has supported the initiative of the council of the Donetsk Science Center of the Ukrainian Academy of Sciences in the organization of educational-scientific-production associations established outside the governmental framework. They are engaged in the improvement in the training of specialists at VUZ's. In shops and individual enterprises, students are performing practical course work and diploma work, and the developments of VUZ's are being included in factory plans for new technology. It must be recognized, however, that not all problems in the activity of educational-scientific-production associations are solved. The further increase in the effectiveness of the work of the associations is dependent on their attainment of a definite legal status and a more exact definition of the rights and duties of the participants--VUZ's, scientific-research institutes, and enterprises. The proposal is being made that the economic ministries permit enterprises to transfer the necessary research equipment and materials to scientific institutions and VUZ's and to allot them a wage fund.

FORMS FOR CREATIVE COOPERATION

Party organizations of Donetskaya Oblast are striving in every way possible to utilize existing scientific potential more effectively. Useful in this connection has been the saying, "The scientists' contribution is the shock work of a laborer." This arose in the department of metallurgy of the

Donetsk Scientific Research Institute of Ferrous Metallurgy and took the form of an agreement for creative cooperation of scientific associates and production brigades from the open-hearth shop of the Makeyevka Metallurgical Plant. With joint efforts, scientists and producers have brought into being a number of valuable innovations which have achieved more than 400 thousand rubles of savings. And the workers of the association "Zhdanovtyazhmash" and associates of the Institute of Electric Welding imeni Ye. O. Paton of the Ukrainian Academy of Sciences, on the basis of mutual socialist commitment, are now developing and introducing progressive technological processes into production. Such forms for organizing competition are bearing good fruit. During the years of the five-year plan, scientific institutions of our oblast have introduced 3450 pieces of scientific research work into production with an economic effect of 340 million rubles. A large complex of research, project-planning, design, and technological developments have been accomplished for various branches of industry. In the current year, more than a thousand developments are still being introduced into production by scientific-research institutes and VUZ's of the Donbass, with an economic effect of 90 million rubles.

In the development and realization of plans for creating new equipment and progressive technology, there is active participation by young scientists and specialists and by scientific-technical societies. About 60 thousand recommendations have been proposed in one year by creative brigades, society bureaus, economic analysis groups, and efficiency councils. Their realization has provided an economic effect of 125 million rubles.

Let us look at the creative work of rationalizers and inventors. There are some surprising data. In comparison with the same period of the last five-year plan, the quantity of utilized inventions has increased by a factor of 1.6, and rationalizers' proposals, by 10 percent. In 1980, 148 thousand inventions and rationalizers' proposals are being introduced into production with a yearly saving of 155 million rubles.

A special place in the work of party organizations is occupied by questions of introducing advanced experience in the field of technology, and efficiency in labor, production, and management. This is becoming an organic part of measures for improving the economic mechanism.

It is useful to examine what we in the Donbass have done in the foregoing period. The L'vov complex quality control system has been assimilated by 243 industrial enterprises. The brigade contract method of Muscovite Nikolay Zlobin has been adopted by 1125 construction brigades. The experience of Zaporozh'ye in lowering the proportion of manual labor has been confirmed at 453 enterprises and 362 construction organizations in our oblast. In the 1979-80 school year alone more than 2.5 thousand schools and seminars were conducted for the study, dissemination, and introduction of advanced experience, in which 30 thousand workers studied. But is this enough? There is insufficient communication of the complexity of the system of accumulation and dissemination of advanced experience on the scale of a factory, mine, or city.

POSSIBILITIES AND RESERVES

Popularization of the achievements of science and technology should also be improved. There are broad possibilities for this. There are in operation 190 "universities" of technical-economic knowledge and 1390 seminars on the problem "The 25th CPSU Congress on Hastening Scientific and Technical Progress." In all, about 100 thousand engineering-technical workers and specialists of the economy are involved in study. Over 430 thousand workers are attending 16 thousand schools of communist labor.

From the first moment of the Tenth Five-year Plan, in industries of the oblast, construction was started on 700 mechanized and automated production lines, 736 shops, sections, or enterprises underwent complex mechanization or automation, and around 4 thousand units of production equipment were modernized. In 1980, still 160 more shops and sections will undergo complex mechanization, and 180 automated or mechanized production lines and 450 automated systems and plants will be put into operation.

But let us take account of the fact that what has been done is far from everything that could be done. The rate of technical rearmament of production as a whole is insufficient, and the breakdown of standards in the mechanization and automation of basic and supporting shops is only slowly being overcome. Still great is the proportion of heavy physical and manual labor.

And not always do individual collectives show sufficient activity. At the Zhdanov Metallurgical Institute and the Kramatorsk Industrial Institute, the subject plans for research are cluttered with inconsequential subjects that have no substantial effect at all on raising the technical level of production. Part of the completed developments of VNIIreaktivelektron, PromstroyNII-proyekt, NIIavtosteklo [expansions unknown], and a number of others do not find practical application. This is explained by both subjective and objective reasons.

First, these institutes rarely carry their own scientific developments forward far enough that they can be immediately introduced into production. This results, in significant measure, because of the lack in many places of a good experimental base. Scientists do not always show persistence and producers do not always show interest in exploiting developments. And, finally, valuable innovations do not always find application in practice because their introduction requires the reorganization of production or reequipment of new industrial units. In this matter, we are justified in counting on a large amount of assistance and cooperation from the economic ministries.

For the successful solution of the most important tasks of scientific and technical progress, it is necessary to conduct fundamental research and to attract large scientific efforts to this work. This was discussed at the conference in the speeches of Professor V. G. Lebedev of the Academy of Social Sciences of the CPSU Central Committee and of other scientists.

The generalization of advanced experience in forming complex systems for controlling scientific-technical progress and introducing advanced experience into practice were addressed in the speeches of A. F. Rumyantsev, chief editor of EKONOMICHESKAYA GAZETA and of many managers of economic organizations.

THE RELATIONSHIP BETWEEN SCIENCE AND PRODUCTION

"The Academy of Sciences of the Ukraine," stated V. I. Trefilov, a vice-president of the Ukrainian Academy of Sciences and chairman of the republic council of scientific-technical societies, in a report to the conference, "in recent years has proposed more than 300 new technological processes to industry. Scientists of the Ukraine are working in creative cooperation with scientific institutions of the USSR Academy of Sciences and with scientific-research organizations of the branches of the economy. Valuable innovations are being utilized at enterprises of ferrous metallurgy, chemical, shipbuilding, aviation, gas, light, food, and other branches of industry. As a result, the level of mechanization and automation of production is growing, quality and reliability are being improved in the equipment and machinery produced, and the use of materials per product is being reduced. Much has been done and is being done for the protection of the environment."

Under contemporary conditions, the need to shorten the length of time for introducing scientific achievements into production acquires exceptional significance. Party and government decisions on the further improvement of the economic mechanism provide for broad measures to hasten the realization of scientific-technical discoveries and developments. The creative exploratory work of scientists must be directed toward near-term growth in production, to be achieved almost entirely by raising labor productivity and not by increasing the number of workers.

An effective form of tie between science and production consists of complex scientific-technical programs. In the Ukraine, work is in progress for the realization of tasks of over 180 national and 79 republic programs. The majority of these are reaching final stages of realization.

But are the advantages of the program-goal method in planning being fully exploited in the republic? Not yet. Many questions relating to the formulation and realization of scientific-technical program have not been resolved. It is necessary also to improve the methodology of program-goal planning.

In the cycle of "creation-assimilation-application of new technology" it is very important to achieve a systematic, continuous transition from one stage to another. In the meantime, existing programs do not cover the given cycle, and its final stages still do not receive the needed attention.

There are doubtless successes in using various forms of relations between science and production. Nevertheless, there is still no organizational apparatus in the republic that fully facilitates the rapid transition from a new scientific idea through all phases--from discovery and invention to broad practical utilization.

To reach the pay-off from new technology and technological processes, as a rule, experimental-industrial plants are necessary. Their creation often is dragged out for many years because of lack of attention by ministries, although their cost does not exceed several percent, and sometimes less, of the total capital investment in a branch of the economy. And even when they exist, experimental shops are often burdened with serial production that interferes with their utilization for scientific purposes.

Economic stimulation of enterprises dependent on output of new technology has heretofore been insufficient. For example, more than 80 percent of the products which receive the state Mark of Quality are realized without any increment in the wholesale price. Deductions for products of second-category quality are hardly ever applied to industrial enterprises in the republic.

The measures contained in the 12 July 1979 decree of the CPSU Central Committee and the USSR Council of Ministers are directed at eliminating such shortcomings. The introduction of indicators of the economic effect of scientific-technical development is conceptually new. Effective measures have been defined for improving the supplies and equipment needed for hastening scientific-technical progress. Reserved of production capacity have been provided for in necessary cases.

At the present time, in the scientific institutions of the Ukrainian Academy of Sciences, in scientific research institutes and design bureaus of the branches of the economy, and in production associations and enterprises, planning is being restructured and economic stimulation of scientific and technical progress is being strengthened in the light of the new decisions.

V. P. Shevchenko, head of the summary section for science and new technology of the Ukrainian Gosplan, introduced some interesting data in his speech. Since the beginning of the five-year plan, more than 500 thousand actions have been taken in the republic for introducing scientific and technical achievements into industrial production, making possible an economic effect of 3.2 billion rubles.

The number of inventions is constantly growing for which tasks for introduction into production are included in the state plan. As a result of the creative activity of innovators, a rationalizers' fund of the economy has been created in the republic. Owing to the utilization of 56 thousand inventions and 3.3 million rationalizers' proposals, 4.6 billion rubles have already gone into this fund.

However, there are also weak links in the chain "science-technology-production." Often the efforts of scientists are scattered over a large number of minor topics which have no noticeable influence on raising the technical level of production. Research in the field of complex mechanization is scant both in basic as well as supporting production processes, and the specialization and concentration of production in supporting shops and sections. This especially pertains to the scientific-research organizations of the Ukrainian Ministries of Ferrous Metallurgy and Coal Industry. In the coal industry, for example, there is delay in creating excavation technology for thin strata and strata with complicated geological conditions. In mine excavation work, the share of heavy manual labor reaches 50 percent.

The level of mechanization and automation is rising too slowly in the electric power, lumber, and food industries of the republic. Still too few developments of high quality are being carried out by scientific and design organizations in the machine-building, construction, and light industries of the republic.

It should be noted that plans for the development of science and technology are not being fulfilled by many enterprises of the USSR Ministry of Power and Electrification, USSR Ministry of the Pulp and Paper Industry, USSR Ministry of the Chemical Industry, USSR Ministry of Chemical and Petroleum Machine Building, and USSR Ministry of Tractor and Agricultural Machine Building that are based within the territory of the Ukraine. This reflects weakness in this aspect of activity on the part of local organizations and Ukrainian Gosplan and insufficient control on the part of union ministries over the implementation of technical policy.

Meanwhile, the country's existing experience--including that of the Ukraine, in Donetskaya, Zaporozhskaya, and Khar'kovskaya Oblasts--demonstrates that there are possibilities for increasing the effectiveness of territorial management of technical progress and that it is necessary to take all possible measures to broaden and deepen this work.

Ukrainian SSR Gosplan has actively joined the State Committee for Labor and Social Problems and scientific-research institutions of the republic in developing plans for the Eleventh Five-year Plan and in preparing and implementing measures for more effective utilization of economic leverage and stimuli to hasten scientific-technical progress.

FROM HAND LABOR TO THE SHOULDERS OF MACHINES

[Excerpts] In the development of science and technology, the more important trend that determines the curtailment of manual and heavy physical labor is the transition from the creation of individual types of equipment to the development and introduction of machine systems.

In recent times, work in the republic has reinforced such a trend. As a result of only four years of the Tenth Five-year Plan, over 278 thousand workers in industry have been transferred from manual to mechanized and automated labor. The proportion of workers engaged in mechanized labor, rose 4.5 percent.

How to hasten the introduction of developments that provide for the liquidation of manual labor was addressed in the speeches of S. G. Galuza, doctor of economic sciences and deputy director of the Institute of Economics of the Ukrainian Academy of Sciences, V. I. Bin', secretary of the party committee of the Berdyansk Road Machinery Plant, G. M. Dobrov, doctor of economic sciences and deputy director of the Institute of Cybernetics of the Ukrainian Academy of Sciences, and S. M. Chernik, deputy director of NIIPTIuglegormash [expansion unknown].

The materials introduced at the conference indicated with all possible clarity the necessity for expanding and strengthening scientific-research work on curtailing manual labor. With this aim, evidently, a special section on this subject should be incorporated in plans for scientific-research and experimental-design work.

At the present time at enterprises in regions and in branches of the economy in the republic, work has been expanding in the preparation of complex programs for curtailing manual labor for 1981-1985. But in this endeavor, it was noted at the conference, a number of operations being done by hand are designated for mechanization; however, the corresponding technical solutions still do not exist. And this is where assistance from scientific-research and design organizations is needed. Systemization, analysis, and substantiation of plans on the part of ministries and agencies of the Ukrainian SSR must become the basis for determining tasks under the Eleventh Five-year Plan for scientific-research and planning institutes for branches of the economy.

In his report, V. N. Poturayev, chairman of the Dnepropetrovsk Scientific Center of the Ukrainian Academy of Sciences, stated that the construction of complexes of machinery and equipment for mechanization and automation of manual labor in basic and supporting plants can effectively be brought about through the organization of complex fundamental and applied research. Such experience is present, in particular, at the Institute of Geotechnical Mechanics.

Today, the efforts of 5 institutes of the USSR Academy of Sciences, 25 institutes of the Ukrainian Academy of Sciences, 13 VUZ's, and 36 scientific-research and planning-design organizations and factories have been enlisted in the research works of the Institute for Complex Programs.

THE MANAGEMENT OF SCIENTIFIC AND TECHNICAL PROGRESS

[Text] One of the effective forms of managing scientific-technical progress consists of the scientific centers of the republic Academy of Sciences, which are located in the most important regions of the republic. The experience of the Donetsk Scientific Center was reported by its chairman, V. G. Bar'yakhtar, academician of the Ukrainian Academy of Sciences. At the present time, the influence of the Scientific Center extends to more than 200 scientific-research and planning-design institutions, VUZ's and their affiliates in the Donbass. In them, there are about 20 thousand scientific workers.

The scientific center concentrates the efforts of scientists and researchers on the solution of urgent regional problems: the development of the productive forces of the Donbass, the rational utilization of natural resources and protection of the environment, the technological development of Donetsk coal and exploration of new ways for making coal-chemistry products, and the improvement in quality and expansion in the assortment of metal products.

These problems are being worked out on the basis of territorial and complex programs. Related to them in particular are programs for planning technology for recultivation of landscape disturbed by the mining industry and for wear-proof technology for leading branches of Donbass industry.

On the basis of regional programs, complex developments are being worked on for individual enterprises. They are being done, in particular, by a number of academy institutes, VUZ's, and scientific-research institutes of branches of the economy for the Donetsk Metallurgical Plant imeni V. I. Lenin, the production association "Donetskgormash," and "Yuzhnodonbasskaya" mine No 1.

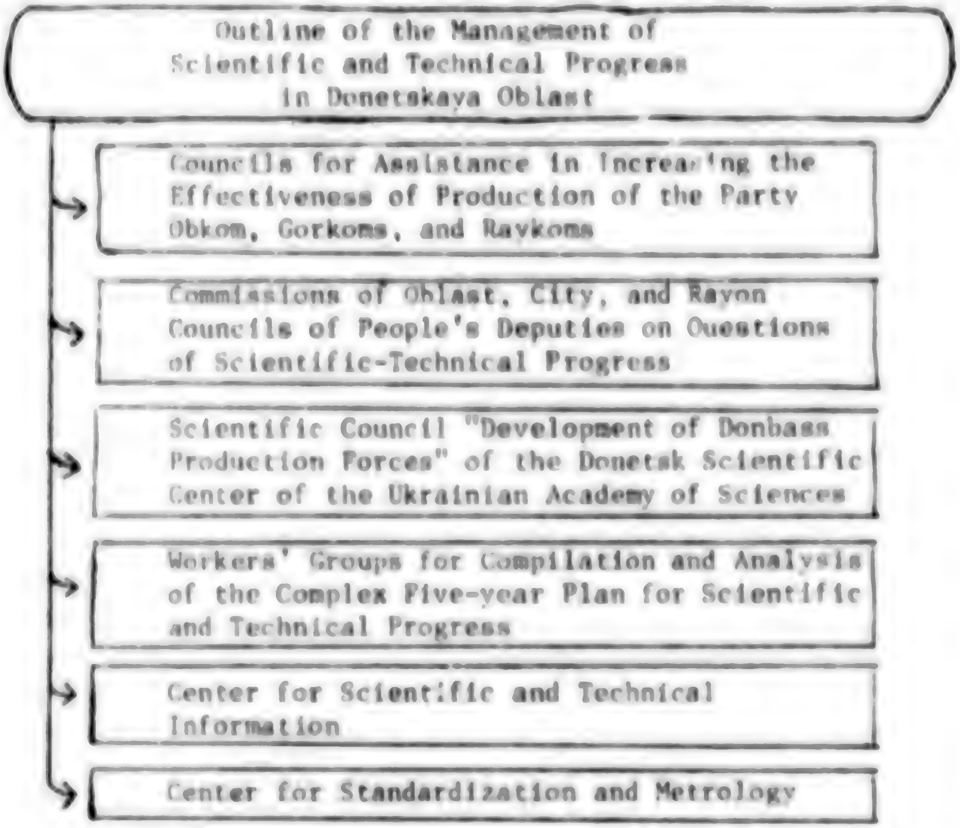
New organizational forms are arising and are becoming established for the complex solution of urgent problems and for strengthening relations between science and production. Thus, the scientific center has actively participated in the creation of educational-scientific-production associations.

Practice confirms that to bring together, coordinate, and direct the efforts of scientists and specialists in the solution of basic problems in the development of the region, is possible under conditions in which a unified system is created in each field with nongovernmental bodies in control of scientific-technical progress. Such a system, which does not interfere with established systems of management within branches of the economy, is a substantial supplement to such management, permits raising the level of party management, and facilitates fuller consideration of and agreement with the interests of individual territories.

An indicator in this sense is the development and realization of complex plans for scientific-technical progress by territorial sections, about which question was raised at the previous Donetsk conference on science and practice.

How the system for territorial management of the scientific-technical process in Donetskaya Oblast looks today was addressed in the speech by N. G. Chumachenko, director of the Institute of the Economic of Industry of the Ukrainian Academy of Sciences and corresponding-member of the Ukrainian Academy of Sciences.

Such a system permits coordination on an oblast scale of the efforts of the collectives of scientific institutions, VUZ's, associations, and enterprises, substantially raises the quality of the planning of technical progress at production associations and at enterprises, and creates conditions for systematic control over the implementation of measures for introducing scientific and technical achievements into production by towns, rayons, and oblasts.



Outline of the Management of
Scientific and Technical Progress
in Donetskaya Oblast

- Councils for Assistance in Increasing the Effectiveness of Production of the Party Obkom, Gorkoms, and Raykoms
- Commissions of Oblast, City, and Rayon Councils of People's Deputies on Questions of Scientific-Technical Progress
- Scientific Council "Development of Donbass Production Forces" of the Donetsk Scientific Center of the Ukrainian Academy of Sciences
- Workers' Groups for Compilation and Analysis of the Complex Five-year Plan for Scientific and Technical Progress
- Center for Scientific and Technical Information
- Center for Standardization and Metrology

However, the formation of a system of territorial management of scientific-technical progress and introduction of advanced experience in Donetskaya Oblast cannot be considered complete. Still to be accomplished are the introduction of organizational-methodological standards of control over the fulfillment of projected plans and the development of an automatized system of collecting and processing information for the calculation and planning of technical progress.

Realization of the provisions of the decree of the CPSU Central Committee and USSR Council of Ministers of 12 July 1979 presents a series of new problems in the further improvement of territorial management of scientific-technical progress. Its place in the management of the economic and social development of regions must be clearly defined.

In the improvement of territorial management of scientific-technical progress, scientific production associations can and must play an active part. The scientific production association "Avtomatgormash" can serve as a typical example. Its composition includes the institute "Donavtomatgormash" and the Makeyevka Mine Automation Factory. The scientific-production association together with the planning-design institutes and machine-building factories of the coal industry is solving a large-scale economic and social task--the creation of technology for coal extraction without the continuous presence of people at the coal-face. A peculiarity of the development is that the automation is destined, as a rule, for application at active or newly planned mining operations. This predetermines the necessity for strengthening the creative and the organizational-economic relations with planning-design institutes and the factories that make the machines.

"It is important in what we are doing to provide unity to the exploratory and applied research of design and technological developments, experimental, and then industrial production of systems and automation means for mining machinery," stated V. A. Antipov, the general director of the association. "Developments are created and introduced through the teamwork of scientific workers, designers, and producers."

In the activity of the collective of the scientific-production association, the following basic forms of teamwork have been applied: with collectives of mines and associations for coal extraction, the testing and introduction of models of new technology; with machine-building and electric-apparatus factories, the field of making prototypes and the organization of serial production of new technology; with scientific-research and planning-technological institutes of other branches of industry, the sphere of research and creation of new construction materials and technological processes. Such cooperation is being brought about within the framework of agreements being arranged.

An important factor in shortening the cycle of "research--production" is that from the beginning it was known which mines would use the future technology; this makes it possible to take account of the concrete conditions of its operation.

All of this allowed the scientific-production association from the beginning of the current five-year plan to obtain 166 authors' certificates for inventions, of which 15 were patented abroad. Now, means of automation include shaving plants, cleaning and processing combines, protective winches, and other mining technology. The economic effect from the introduction of means of automation developed and manufactured by the association exceeds 16 million rubles.

The solution of tasks for further automation of mining technology dictates the necessity for expanding cooperation between the collective of the association and other scientific-research institutes, including also academy institutes.

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NEW SYSTEM FOR INTRODUCING TECHNOLOGY INTO INDUSTRY

Tallinn SOVETSKAYA ESTONIYA in Russian 14 May 80 p 2

[Article by Kh. Martinson, scientific secretary of the Institute of Chemistry, Estonian SSR Academy of Sciences, and candidate of chemical sciences: "The 'Science is Production' System: The First Step"]

> [Text] The shift of the center of gravity in production from extensive to intensive development gives rise to still greater need for advancement on all fronts in introducing conceptually new, fundamental achievements of science and technology into production, thoroughly revolutionizing the production process. This can be done only with a GENERAL TWO-WAY SYSTEM OF RELATIONS BETWEEN SCIENCE AND PRODUCTION. Such a system of organizing research, development, and introduction into production of scientific and technological achievements, would unite academy science with ministerial science and production and, in the final analysis, would not throw together a simple aggregation of systems from various agencies and branches of the economy, but would rest upon conceptually new scientific-technical achievements of significance across the boundaries of the various branches of the economy.

The creation of such a system is an extremely complicated and many-faceted task. It is all the more so because even within a single branch of the economy the spread of research results from laboratory walls to factory shops still takes place with pain and conflict.

Basic, fundamental problems are resolved in this country, as is known, in academy institutes and in the departments and scientific units of higher educational institutions. Applied science problems raised by current needs of a branch of the economy are resolved in ministerial institutes. Under the general state "science is production" system effective means must be found for unifying the efforts of academy science with the science and production of the branches of the economy to achieve rapid introduction of complex scientific-technical results into production.

However, each complex task consists of many problems which are solved by stages. Thus, in a given case, it is necessary to find forms for long-term science-production cooperation; to develop planning and organizational principles for such cooperation, a system for evaluating the fulfillment of tasks, and the bases for encouraging participants in the work; and to solve dozens of other questions.

The USSR Ministry of the Chemical Industry [Minkhimprom SSSR] can be considered a pioneer in developing the new "science in production" system in our country. In 1976 this ministry made a proposal to academy science to develop long-term plans and programs of joint activity to create new chemical processes and to introduce them into production. The academies of sciences of the Ukraine and Kazakhstan and of the Transcaucasian and Baltic republics responded at once to the proposal. The first coordinated plans for joint work by the Minkhimprom and the republics just named were developed and approved for the tenth five-year plan. The Minister of the Chemical Industry and the presidents of the academies confirmed them with their signatures on the corresponding orders and decrees.

The first step has been taken in eliminating existing contradictions and difficulties in the introduction of research results into production, with the organization of systematically planned cooperation. It is clear to everyone that the stability of production is disturbed when scientific-technical achievements are introduced; when the chief goal is stable output of products, it must proceed with calculated risk. It is natural that the introduction of innovations, especially large ones that require the reorganization of production, never can be painless for the production process because enormous technological, organizational, and psychological difficulties must be overcome.

Any new systems for the introduction of new technology must take this contradiction into account, creating, in the final analysis, such conditions that the disturbance of economic stability by technical backwardness would be more noticeable and deep for the enterprise than would be the disturbance of economic stability by the introduction of scientific-technical achievements.

Up to the present time, as is known, the obligations, the interests, and the responsibilities of producers for the assimilation of scientific results and the radical renovation of processes have not been fixed by any legislative acts. The struggle for introduction of these works into production remains in the hands of the scientists themselves. But the introduction of new technology is a two-way process, in which the center of gravity lies within the sphere of responsibility not of science but of production itself.

How does the new form of research coordination and introduction of new technology in Minkhimprom differ from the economic agreements used up to now between academy institutes and ministerial institutions?

The new plans, on the one hand, are "superstructures" of economic agreements built up on their base; on the other hand, they are "bricks" for putting together large, long-term interdepartmental programs. In the new plans, the final goal for each task is clearly formulated and the direct entrance into production is indicated. Distinguishing features of the plans are their long-range outlook and their complexity. In them, the stages are fixed for research, experimental, and planning-design work and the length of time and cost of each step are determined.

In contrast with economic agreements, there is no division of the participants into purely "requestors" and "performers." Ministerial institutions directly participate in the conduct of experimental work, the results of which serve the institutes as the basis for conducting the next stage of research. At the same time, scientists and specialists of ministerial research institutions and production experts become equal coauthors of developments, bearing responsibility for the introduction of the results into production.

Very important for scientists under the new system are the guarantee of experimental work by ministerial organizations, and the advance determination of actual partners in all stages of work and also of the places and periods for the introduction of the results. Financial guarantees by the ministry of all experimental and some of the research work also have very great significance.

Chemists of the Academy of Sciences of our republic have reacted actively to the proposal to cooperate with institutions of Minkhimprom; they looked over existing "reserves" of ready developments and presented the ministry with a proposal for cooperation on six topics. Of these, the ministry selected five that were included in the orders and decrees signed in May 1977. They covered the following subjects: first, the development of the synthesis of new surface-active substances applicable to the production of cinema photographic materials. New substances are permitting improvement in the quality of these material, the preparation of special-purpose tapes and photographic paper, and the decreased use of scarce raw materials in their production. Experimental batches of these new products, prepared at the experimental plant of our Institute of Chemistry, were successfully tested at the Krasnoyarsk factory "Kvant," at the Shostka production association "Svema," and at the VNIIkhimfotoproyekt. The work from the Institute was managed by doctor of chemical sciences S. Favngol'd.

Many years of effort by the collective of scientists working [illegible] the direction of doctor of chemical sciences K. Leets has been directed toward the development of complex technology for the production of fragrant substances--citral, geraniol, and others, and also of new nontoxic substances for the control of insect pests--analogs of the juvenile hormone and pheromones. Results of research and experimental work on the synthesis of fragrant substances were embodied in a 1979 technical project completed by Minkhimprom organizations. It foresees experimental-industrial production of six valuable fragrant substances from a nonscarce raw material--isoprene. The organization of this new production at one of the Minkhimprom enterprises is contemplated within the next few years. Now, the center of gravity of research work is shifting to the development of methods for the synthesis of new fragrant substances and also to the study and synthesis of new preparations for fighting agricultural pests and transfer of experimental batches for testing in specialized institutions.

The remaining subjects are also related to products for agriculture. One of them is the development (under the direction of candidate of technical sciences G. Rayalo) of technology for the preparation of initial substances for the synthesis of new insecticides that are not harmful to man and higher animals. The second is a broad, complex program for utilizing phosphorite deposits in the Estonian SSR. It is being accomplished by a series of scientific institutions of the republic and of USSR Minkhimprom under the general direction of corresponding member of the Estonian Academy of Sciences M. Veyderm. In the past years, the system of planning and conduct of joint work developed by USSR Minkhimprom has been polished and perfected. Centers for the control of science and technology of the ministry have been created in all of the republics and they organize coordination work locally. Scientists from higher educational institutions are brought into the cooperation; systems have been worked out for the review and approval of proposals by all-union associations and for establishing scientific-technical and technical-economic foundations for the conduct of work; a system of outline-agreements has been developed for joint work; and other questions have been addressed.

The seed planted four years ago has produced a rich harvest: for the next five-year plan scientists have prepared several times more proposals for cooperation than for the present one (over a thousand for the country as a whole). The economic effect achieved by the introduction of research results already now equals tens of millions of rubles. The scientists of our republic submitted 24 proposals for cooperation for the 1981-1985 five-year plan; of these 22 were accepted.

The basic burden of joint work being planned for the future in the republic falls to higher educational institutions: the Tallinn Polytechnical Institute (11) and Tartu State University (5). The Institute of Chemistry proposed five developments and the Institute of Cybernetics, one. The proposals reflect the main achievements during the present five-year plan that are ready for application. They cover a wide range of problems from the synthesis of new valuable organic products to the construction of original analytical instruments.

And so, let us sum up: cooperation between ministerial organizations and fundamental research institutions provides the branch of economy a continuing flow of new ideas and a backlog of exploratory work necessary to guarantee scientific-technical progress, the more so because the share of exploratory work in the plans of the scientific institutions of Minkhimprom itself has been decreasing in recent years.

The system described above for the organization of cooperation among ministries, academies, and higher educational institutions has been approved by the USSR State Committee for Science and Technology of the USSR Council of Ministers and will be spread during the next five-year plan to other ministries and agencies of the country. But this is only the first step in forming a general state system for the introduction of scientific achievements into production which are being developed and tested for practical application. In time, it must be raised to a "superministerial" level and must acquire the intergovernmental, interdisciplinary character of which we have been speaking. The aim of such cooperation will be to proceed from the objective logic of scientific-technical progress and from the higher interests of the economy.

9645
CSO: 1861

GLEBOV STRESSES ROLE OF INTERDEPARTMENTAL COUNCIL IN ENERGY R&D

Leningrad LENINGRADSKAYA PRAVDA in Russian 30 May 80 p 2

[Interview with Academician I. A. Glebov, chairman of the Interdepartmental Coordination Council of the USSR Academy of Sciences and director of the All-union Scientific Research Institute of Electrical Machine Building, by A. Travin: "Accelerated Development for the Energy Complex: The Solid Foundation of Progress"]

[Text] Whatever plans are contemplated for the economic and social development of the state, be they for construction of a new enterprise or city, the launching of the next ocean vessel, or the creation of a great rolling mill, what the realization begins with is concern for a reliable energy base. And that is why it is profoundly natural that its further improvement is given a large amount of attention by the party.

Questions of strengthening the fuel and energy potential and of increasing the contribution of the people of Leningrad in this important national matter also constantly hold the center of attention of the Leningrad party organization.

In his speech at the November (1979) Plenum of the CPSU Central Committee, Comrade L. I. Brezhnev assigned high value to the creation in our city of machines and systems and high-capacity power equipment. At the plenum of the party obkom which took place in April there was a detailed discussion about increasing the contribution of the people of Leningrad to the development of the fuel and energy complex.

Our correspondent talks about the tasks being solved today by Leningrad scientists, workers, and engineers with the chairman of the Interdepartmental Coordination

Council of the USSR Academy of Sciences and director
of the All-union Scientific Research Institute of
Electrical Machine Building, Academician I. A. Glebov.

[Question] The names of turbines, generators, gas pumping stations, and other equipment created by the people of Leningrad for the great projects of the economy, are associated as a rule with descriptive words like "the largest capacity," "unique," and "highly productive." What can our fellow citizens put on the credit side of the ledger in concrete terms?

[Answer] There is a great deal on the credit side. As a citizen of Leningrad I take pride in their creations, the size, the inspiration of their labor. Today, every second generator and every second turbine operating in electric stations are made in our city. Just during the years of the Tenth Five-year Plan they have produced systems with an individual capacity of 800 thousand kilowatts for thermal stations, atomic reactors with a capacity of a million kilowatts, hydroelectric systems of 640 thousand kilowatts, and equipment for primary energy blocks with a capacity of 1.2 million kilowatts. They have created highly productive boiler systems, designed for the use of coal from the Kansk-Achinsk Basin, and compact engines with increased output and a capacity of 8 to 10 thousand horsepower.

Remarkable engineers, scientists, and workers are laboring among us. They are achieving such a level of production that will allow us to strive for still higher goals and to pass new frontiers.

Let me emphasize: it was not accidental that the 25th CPSU Congress set the task of increasing the capacity of systems being produced. It is very advantageous economically: the greater their capacity, the less the cost of construction per unit, the specific labor expenses, and the amount of metal used. In this work it is especially important to use the latest achievements of science and technology.

[Question] Do specialists tie hopes for achieving increased effectiveness in the development of the energy complex to the development of such trends in scientific and technical programs?

[Answer] Remember what rapid progress was caused by the application of the channel-type reactor, construction of which was first proposed by Soviet scientists? It was this that permitted our own Soviet atomic power to appear at the forefront in using energy blocks of a unit capacity of a million kilowatts. The first such block was put into operation over six years ago at the Leningrad atomic electric station imeni V. I. Lenin. It was at the head of a large series of atomic electric stations now operating or being constructed with planned capacity of 4 to 5 million kilowatts.

The selfless labor of Leningrad workers, engineers, and scientists who make a heavy contribution to the development of the nation's energy, receives high praise from the party and government. Comrade Leonid Il'ich Brezhnev warmly congratulated the great labor victory of the participants in the construction of, and the operators of, the Leningrad AES imeni V. I. Lenin, and the scientists who brought about the commissioning of the station's third block ahead of time.

Today, supercapacity power blocks of 1.5 million, and 2 and 2.4 million kilowatts, operating on heated neutrons, are being created. Structures that are original in their approach are being developed on the basis of fast neutrons. Until now, such systems have not been known either here or abroad. This technology is extremely economical and reliable in operation. The task is to bring about as soon as possible the beginning of series production of highly effective equipment.

The use of superconducting generators in thermal and atomic stations will provide great advantages. These conceptually new machines have a very high coefficient of useful operation and size indicators lower than with traditional systems. The first superconducting generator with a capacity of 20 megawatts already has been created at the All-union Scientific Research Institute of Electrical Machine Building. It will be installed at the first Leningrad GRES. But the scientists who built it are striving further: a plan has been developed for a superconducting generator with a capacity of 300 megawatts.

[Question] And so, the capacities of power projects grow. Is it not evident that the principal significance in these conditions consists of cutting back the loss in the transfer of energy to users and its economic expense?

[Answer] Very true. The level of power is characterized not only by the capacity of electric stations, but also by the length of high-voltage electric transmission. During the five-year plan their length should grow by 195 thousand kilometers. This will allow not only the effective use of fuel and hydroelectric resources, but also a decrease in the number of reserve systems in the united power system of the country, an increase in reliability of electrical supply, and a decrease in loss of energy connected with distribution to consumers.

Research conducted at the Scientific Research Institute of Direct Current and at the Polytechnical Institute imeni M. I. Kalinin, has laid the solid foundation for planning lines for alternating current of 750 and 1150 volts. The achievement of 1800 kilovolt transmission lines for alternating current is fully possible.

It is also very important that electric engines, fuel apparatuses, diesels, compressors, and other equipment become more economical and lasting. At the Carburetor and Armature Factory imeni V. V. Kuybyshev, for example, every other type of product in its nomenclature already has been renovated during the present five-year plan. This fact shows what this does for the country: the use of improved carburetors created by the people of Leningrad, allows a saving of 3 liters of fuel in truck engines for each hundred kilometers of travel.

Great work in creating highly economic devices and instruments is being done at the scientific-production association TsKTI imeni Polzunov, the Central Scientific Research Institute of Fuel Devices, and much has been done in the associations "Izhorskiy Zavod," "Nevskiy Zavod," "Proletarskiy Zavod," and "Zvezda."

[Question] Now, in the closing year of the five-year plan, what are the problems, in your view, that require special attention from scientists, specialists, and producers?

[Answer] There are many such problems. We still do not always satisfy the needs of the economy for contemporary equipment. Unfortunately, outdated technical solutions are sometimes put into projects and the estimated costs of projects are often overstated; and the amounts of metal in equipment are being reduced slowly. Individual types of machines are behind the best world models in their indicators. Sometimes, the length of time for assimilating new articles stretches on and on.

The collectives of enterprises simultaneously must use energy resources more rationally, must strengthen the practice of conserving energy and fuel, and must calculate savings more fully in balancing the results of socialist competition.

[Question] What from existing experience, in your view, should be utilized in the final segment of the Tenth Five-year Plan and in the Eleventh Five-year Plan, plans which are now being formulated?

[Answer] We are learning, while bringing about great economic programs, to combine effectively the creative capabilities of the collectives engaged in the total effort. A deepening of this experience is one of the chief possibilities for a notable increase in the rate of development of the energy complex. It is very important now to use the forms that have been proven in life for the organization of joint labor of cooperators, to limit the consideration of jurisdictional and territorial principles, of industrial management in the interests of more fully solving both national problems and also tasks of regional character.

Today, for example, much d[illegible] the institutions of the USSR Academy of Sciences, on the scientific-research institutes and design bureaus of the branches of the economy, and on higher educational institutions. To increase the effectiveness of their activities, an Interdepartmental Coordination Council of the USSR Academy of Sciences was created in Leningrad; the council is charged with the coordination of research in line with the leading trends in science. Together with enterprises and organizations of power machine building, it conducts much work on creating complex interdepartmental programs, covering the creation of highly effective types of new power equipment, the modernization of techniques, and the acceleration of fundamental research on the utilization of new types of fuel, sources of energy, and so forth.

While reorganizing the whole operation of the economy as required by the decree of the CPSU Central Committee and the USSR Council of Ministers on the further improvement in the economic mechanism, it is necessary to come to decisive terms with the concentration of labor and material resources on fulfilling national programs, on deepening competition for increasing labor productivity, the maximum use of basic resources, and the conservation of material and labor resources. In the competition developing everywhere for fulfilling the tasks of the Tenth Five-year Plan ahead of schedule and for welcoming the 26th Party Congress, it is important that these aspects of work find full reflection.

What is the best way to deal with this? The experience of Leningrad enterprises and organizations if accomplishing high quality work and in shortening the construction time for the Sayano-Shusheyskaya GES is widely known. It also completely proved itself at other projects. It is natural that this experience is also being used in connection with realizing programs for the development of the fuel and energy base. A specially created staff in the Council for Economic and Social Development of the Leningrad Party Obkom directs all of this work. The fulfillment of the Leningrad complex fuel and energy program in large measure depends on the operations of this staff.

It is important that collectives participating in the implementation of energy programs be put under strict party control from the very beginning for the realization of current and future plans. The best results can be achieved only under conditions whereby all this great, much-planned work will be accepted by each participant as a fighting program of action, a program which unites the needs and concerns of today with the long-range plans for tomorrow.

9645
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SHORTAGE OF TECHNICAL SPECIALISTS THREATENS GEORGIAN INDUSTRIAL DEVELOPMENT

Tbilisi ZARYA VOSTOKA in Russian 7 Jun 80 p 2

[Article by N. Pirtskhalava, head of the sector on the economics of science of the Scientific-research Institute for Economics and Economic Planning of the Georgian SSR Gosplan and candidate of economic sciences: "The Five-year Plan and Scientific-technical Progress: Potential and its Realization"]

[Text] The study of the social and economic aspects of scientific activity helps raise the level of control over science and the forecast of the most important results of research.

Our institute became interested in this problem only relatively recently. However, already the first results of this study offer a possibility for estimating the level of scientific potential in the republic and the patterns and trends in its development and for comparing them with current socioeconomic programs.

In Georgia today there are dozens of scientific institutions, including higher educational institutions. A quarter of these institutions fall within the sphere of the Georgian SSR Academy of Sciences and the specialized academies, and the remainder are subordinated to various union-republic and republic ministries and agencies. The number of scientific-research institutes and their branches is growing from year to year. This growth is especially characteristic for ministerial scientific-research institutes. A new organizational form has gained strength which makes possible more organized relations between science and production: the scientific-production associations. They already function in the machine-building and food branches of the economy and in the building-materials industry.

The large number of scientific research institutions in the republic is itself indicative of a wide variation in types of scientific potential. It is difficult, however, to judge the character and the scale of scientific-research work by this indicator alone. A clearer picture is presented by the numbers of scientific personnel and analysis of breakdowns of these numbers.

The numbers indicate that the proportion of workers engaged in the sphere of science and science services in the Georgian SSR makes up 1.3 percent of the general population. For each ten thousand inhabitants of the republic are several tens of scientific workers. This is a high indicator. Moreover, it keeps growing, especially in the natural sciences and engineering fields of knowledge. From 1961 to 1971 the rate of growth in these fields was 7.6 percent compared with 2.9 in all other fields. That is why at the present time more than half of the scientific personnel work in the sphere of natural and engineering sciences, which also calls for praise.

The statistics, as we see, are reasonably reassuring. Do they nevertheless provide a basis for making a judgment about the effectiveness of ongoing research and its quality? Apparently, one can answer these questions more objectively by analyzing the qualification levels of scientific personnel. As of 1979, 1323 doctors of science and 8287 candidates of science were engaged in the sphere of science and science services and also in various branches of the economy of the Georgian SSR. The number was large also for academicians and corresponding members of the Georgian Academy of Science in the republic. And this, of course, is an indication of the high qualification level of scientific personnel that puts Georgia among the republics better provided with highly qualified specialists.

Now let us try to estimate the composition of scientific manpower from the point of view of their distribution among the branches of the economy. The correlation here is not optimum. It is sufficient to say that more than 60 percent of all scientific workers work in the nonproduction branches of the economy, that is, the sphere of public health, education, and culture. As a rule, these are specialists with high qualifications. Let us say that in public health, for every 100 scientific workers there are 11 doctors of science! But at the same time, in many important spheres the number of workers with advanced degrees can be counted on the fingers. And it is not only a matter of the advanced degrees. Those who have defended dissertations in medicine often are unsuccessful in securing work equal to their qualifications. And this is at a time when inhabitants of the far corners of the republic, especially of high mountain regions, justifiably complain about having no physicians at all or too few. One wonders, incidentally, if this applies not only to public health workers but also to scientists who are economists, sociologists, and planning specialists.

Analysis shows that the large proportion of workers with advanced scientific degrees is characteristic also for the geological, agricultural, historical, philosophical, and biological sciences. The very lowest proportion distinguishes the engineering, chemical, art history, and pedagogical spheres. This fact, one would think, deserves considerable attention.

In recent years, scholars of scientific affairs have begun to examine more and more carefully the age composition of scientific manpower. This is a sort of calling-card of the functional capabilities of the scientific collective. The specialists have even determined the age peak of scientific creativity. This is from 30 to 40 years. It is in those years, according to the observations, that the fuller creative potentials of the scientist are expressed and in those years that his most interesting research is found. In Georgia, the share of scientific workers under 40 years is 46 percent. Among them are a little more than 27 percent of the candidates of science and about 2 percent of the doctors of science. It must be confessed that there is little that is pleasant in these statistics.

Measures for improving postgraduate study are already contemplated in the republic. However, one should think that in the future it would also be necessary to improve the statistical reporting: the accounting for postgraduate students and dissertations. This would provide the possibility to coordinate better the activity of specialized councils for dissertation defense and to raise the qualitative parameters of postgraduate work as a whole. To improve the composition of scientific manpower it is important to stir up the structure even in the training process for undergraduates in republic higher educational institutions. In the 1977-1978 school year, there were 80 thousand students here. This is more, by a factor of 1.5, than there were 12 years ago. The graduation of specialists during that time increased by 76 percent and made up 16 percent of the total number of students.

The distribution of young specialists among branches of the economy also deserves special attention. Thus, according to 1978 data, among those leaving the walls of higher schools, 25.6 percent were specialists with engineering diplomas, 12 percent were for agriculture, 50.4 for public education, 7.5 for public health, physical culture, and sport, and 4.5 for art. As we see, the bulk of the graduates were teachers. This disproportion is especially alarming even more because with each year the graduation of specialists for material production branches of the economy is decreasing. And this can be a serious obstacle for the development of the progressive branches of industry.

Thus, this rough analysis of the manpower potential of Georgian science has allowed us to bring a number of problems to light that urgently require solution. Here was concealed an important key to raising the effectiveness and quality of scientific research and to the active introduction of scientific achievements into production, toward which the decisions of the 25th CPSU Congress and of the 25th Georgian Communist Party Congress were aimed.

9643
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MESHKOV ON VUZ-INDUSTRY R&D COOPERATION IN BELORUSSIA

Minsk PROMYSHLENNOST' BELORUSSII in Russian No 5, 1980 pp 42-45

[Article by N. Meshkov, minister of higher and secondary specialized education of the Belorussian SSR: "Problems of Scientific-Technical Progress: VUZ Science Is Production"]

[Text] Science ever increasingly is becoming a productive force of society and a powerful means for achieving the goals of the Soviet people. VUZ science in our republic also makes a definite contribution to scientific-technical progress. First of all, it supplies qualified specialists to all levels of the "research-development-production" process; it implants in its brood the ability to find original technical solutions, to cope with the ever-growing flow of scientific-technical information, to assimilate quickly what is new, and to manage people skillfully. Today, VUZ's of the republic basically satisfy the needs of the republic for specialists in all developing areas of science and engineering.

VUZ science has everything necessary to solve scientific and practical tasks. In the VUZ system of the Ministry of Higher and Secondary Specialized Education alone there are over 10 thousand scientific-pedagogical workers, including 200 doctors and 3250 candidates of science, and over 1590 postgraduates are studying. Furthermore, many thousands of students are participating in scientific investigations. The higher-school system has two scientific-research departments, three scientific-research institutes, the same number of special-design-technology bureaus with experimental shops, 12 problem laboratories, 28 scientific-research laboratories for branches of the economy, a computer center, and other scientific units. VUZ's are supplied with modern scientific and shop equipment costing over 60 million rubles.

The output is also great, especially in physics, chemistry, chemical technology, electronics, machine building and metallurgy, and construction. The number of scientific publications, monographs, and inventions is increasing year by year. The economic effect from the realization of VUZ developments just from 1976 to 1979 equalled over 150 million rubles.

We look upon all these achievements, however, only as a beginning of a large and complex job: above all, to solve one of the chief tasks of scientific-technical progress--the rapid and large-scale realization of new scientific ideas and engineering developments in industry and other branches of the economy.

Practice demonstrates that with the accumulation of scientific-technical potential there is a sharp increase in the loss from delay in realizing progressive solutions. That is why the scientists of higher schools search for and cultivate various forms of relations between VUZ science and not only individual and often large enterprises but also with whole branches of the economy.

One of the common forms of relations with branches of the economy has been economic agreements for the fulfillment of applied scientific-technical and experimental-design work on orders from enterprises and organizations. Each year, the quantity of research done by VUZ scientists on this basis is growing; its importance and timeliness are increasing. Usually, before concluding an economic agreement, there is a preliminary technical-economic substantiation with an obligatory calculation of the proposed economic effect. Patent-information research is conducted of all work completed under economic agreements. As a result, 48.8 percent of the work is considered major. In the Belorussian State University, the Belorussian Polytechnical Institute, the Minsk Institute of Radio Engineering, and the Vitebsk Technological Institute of Light Industry, the proportion of major work is more than 50 percent of the total.

A significant portion of the applied research projects (40 percent of the 369 economic agreements fulfilled in 1978) were introduced into the economy immediately after their completion. The remaining projects were included in plans for experimental production trials and innovations of production associations, factories, enterprises, and organizations for futures. Altogether, in 1979, republic VUZ's introduced more than 400 developments into production, permitting the economy to achieve an economic effect of more than 53 million rubles.

The development and strengthening of relations between higher schools and production makes possible the creation of scientific-research laboratories in higher educational institutions that are oriented toward branches of the economy. These units help to solve quickly the problems that arise in industry and significantly shorten the period of time from the end of a development to its introduction into production. At the present time 28 VUZ laboratories for branches of the economy fulfill 10 percent of the scientific research done under economic agreements.

The creation of laboratories with the aim of fulfilling large long-range projects continues. In 1978-79 alone the following scientific-research laboratories for branches of the economy were organized: electronic means and methods for developing optical information, physical methods and means for diagnostic control of power plants (Belorussian State University); electromagnetic fault detection, modified concretes, operational optimization and complex automation of thermal electric stations, artificial automobile-road construction (Belorussian Polytechnical Institute), technology for creating microheterogeneous structures for electrophysical radiation methods (Minsk Radio Engineering Institute), and others. The organization of laboratories and sections directly at enterprises and associations was provided for by the decree of the CPSU Central Committee and USSR Council of Ministers, "On Raising the Effectiveness of Scientific Research Work in Higher Educational Institutions." Work toward the creation of such laboratories and affiliates is already extensive. The Novopolotsk Polytechnical Institute, the Mogilev Institute of Machine Building, and other VUZ's are participating in this work along-side production collectives.

A new form of creative relations between VUZ's and production has undergone significant development in the higher school system of the republic: the educational-scientific-production association established outside the governmental framework (UNPO). The first of their kind, created in 1974--the Belorussian Polytechnical Institute together with the Minsk Tractor Plant (UNPO "BPI-MTZ") and the Minsk Automobile Plant (UNPO "BPI-MAZ")--confirmed their high effectiveness. Their experience was widely confirmed by other VUZ's of the republic. Specifically, the following UNPO's were created: the Minsk Institute of Radio Engineering jointly with the "Integral" production-technical association, the Scientific-research Institute of Computers, and the computer factory imeni G. K. Ordzhonikidze; the Belorussian State University jointly with the "Integral" production-technical association, the Mogilev institute of Machine Building, and the Mogilev automobile and elevator factories; the Vitebsk Technological Institute of Light Industry jointly with the Vitebsk carpet factory; the Belorussian Institute of the Economy jointly with agricultural enterprises of Logoyskiy Rayon and the state bearing factory No. 11; the Belorussian Technological Institute imeni S. M. Kirov jointly with the Belorussian Ministry of Forestry, the Belorussian woodbuilders enterprise, the Belorussian Ministry of the Lumber Industry, the Gomel' chemical plant imeni the 50th Year of the Belorussian SSR, the Belorussian tire combine, the "Minsk Furniture Project" association, and enterprises of the USSR Main Administration for the Microbiological Industry that are located within the Belorussian SSR. With a number of others, there are 24 UNPO's in all.

In 1978 alone, participation in UNPO's involved 109 structural units (scientific-research institutes, problem scientific-technical laboratories, experimental scientific-technical laboratories, special design-bureaus, faculties, departments, and sections), 8 VUZ's (Belorussian Polytechnical Institute, Belorussian State University, Gomel' State University, Belorussian Technological Institute, Belorussian State Institute of the

Economy, Mogilev Institute of Machine Building, and the Vitebsk Technological Institute of Light Industry), and 1021 scientific-educational associates. The more qualified engineering-technical workers of 124 production associations, factories, ministerial scientific-research institutes and special design bureaus, and other services, directed the work of almost 4 thousand students who participated directly in the UNPO's. More than 5.6 thousand students became acquainted with the organization of production at enterprises, and 867 practical course and diploma assignments and projects in 51 specialties were fulfilled. Three VUZ departments were created at factories and production associations. Eighty-four projects worth 1.8 million rubles were fulfilled under economic agreements. More than 10 million rubles of economic effect was achieved from 1976 to 1979 from the introduction of VUZ developments into production. The effect for developments within the UNPO framework was 1.93 rubles for 1 ruble of expenditure, which was higher than the average indicator for the ministry (1.55 rubles). Fifty-eight scientific-research projects were fulfilled by scientists in UNPO's without compensation. Eleven hundred and fifty-three students participated in scientific research according to UNPO plans. Sixty-one joint invention claims were submitted by VUZ's and enterprises, and more than 20 positive decisions were made for the issuance of authors' certificates.

At the present time, preparatory work is being done for the creation of new UNPO's: "The Fauna of Poles'ya" with participation by Gomel' State University, the Brest Pedagogical Institute, and Belorussian preserves; the Novopolotsk Polytechnical Institute and the Novopolotsk petroleum refining plant, and the Brest Institute of Engineering and Construction with leading construction organizations.

It is necessary to note also that some UNPO's have definite shortcomings. For example, the work of associations does not everywhere come to grips with the basic aspects of the activity--the educational process, scientific research, and the organization of exploitational developments. Individual UNPO's work without long-range plans and carry out many uncoordinated projects. Let us the managers of both VUZ's and enterprises turn our attention to this.

Agreements for Scientific-technical Cooperation (DNTS) have achieved broad distribution in the republic. In 1978 VUZ efforts fulfilled more than 800 such agreements (28 percent more than in the preceding year), of which 205 were completed and 313 newly arranged with enterprises and organizations. The Belorussian Polytechnical Institute has the largest number of DNTS's--262, of which 69 were finished in the past year and 122 were newly arranged.

Examples such as the following illustrate the effectiveness of this form of creative cooperation. The utilization of developments accomplished by the Belorussian State University on the basis of DNTS's gave the economy an economic effect of over 1214 thousand rubles, which exceeds the indicators of the previous year by a considerable amount. Students took active part in the solution of a number of production problems in accord with a complex DNTS concluded for the Tenth Five-year Plan between BGTKhI [expansion unknown] and the Minsk scientific-production association for furniture. Components and elements made from powdered materials were introduced into production by the Scientific-research Institute of Powder Metallurgy of the Belorussian Polytechnical Institute at the Polotsk fiberglass plant, the Minsk "Gormolzavod," the "Tulachermet" scientific-production association, and other enterprises. The economic effect of their introduction into production was 589 thousand rubles.

Practice convinces us that the more effective form of relations between science and production are the scientific-production associations which allow sharp (by a factor of 1/2 or 1/3) decreases in the length of time for introducing innovations into production. So, it seems correct and timely that a scientific-production association for powder metallurgy and protective coverings has been organized on the basis of the Scientific-research Institute for Powder Metallurgy of the Belorussian Polytechnical Institute and a powder metallurgy factory that is being created. It is supposed that the creation of an association will shorten considerably the length of time needed for introducing the results of scientific research, will conserve a large quantity of ferrous and nonferrous metals and alloys, and will lower the amount of labor required for preparing powdered articles.

Each year the quantity of work introduced into production by VUZ's in the ministry on the basis of the typical agreement is increasing. This refers to transferring scientific-technical achievements to other enterprises and organizations and offering them assistance in utilizing assimilated experience. Thus, the problem laboratory of complex utilization of lumber of the Belorussian Technological Institute introduced in the "Vil'nyusstroydetal'" the technology for pressing honeycombed slabs of increased thickness, which permits increasing the volume of production, lowering the cost of products, and achieving 459.4 thousand rubles in economic effect.

In accord with the decree of the Belorussian Communist Party Central Committee and the Belorussian SSR Council of Ministers, "On Measures for Further Improvement in Planning Scientific-research Work and Hastening the Introduction of Its Results into Production," scientific and other institutions of the republic are realizing a new approach to the organization of scientific research and transfer of its results to the economy. Whereas earlier, for example, the planning of research as a rule was accomplished by the researcher himself, leading to insufficient consideration for the needs of production, now ministries and agencies submit commission-orders to Belorussian SSR Gosplan which list research topics, provide the technical-economic basis for the advisability of their development, and designate the desired performer. The most urgent commission-orders are becoming the plan topics: they are guaranteed financing and supplies and equipment. The republic Gosplan is granted the right to include long-range topics and scientific-research trends and to curtail nonurgent work in the State Plan for Economic and Social Development of the Belorussian SSR.

Today, more than 30 percent of the funds allocated for scientific research by the Plan for the Economic and Social Development of the Belorussian SSR are for the fulfillment of the scientific-technical programs of higher educational institutions of the Belorussian Ministry of Higher and Secondary Specialized Education. VUZ's of the ministry are fulfilling 90 tasks determined by the economic plan of the Belorussian SSR, participating in the development of 12 scientific-technical programs for the solution of the most important problems of the republic and of the branches of the economy, and 35 tasks for republic programs for the introduction of new technology, which are oriented toward the achievement of important economic goals.

For example, the Scientific-research Institute of Powder Metallurgy of the Belorussian Polytechnical Institute is fulfilling a program for the introduction at industrial enterprises of the republic, of new types of articles and components made by means of powder metallurgy methods. This work is proceeding successfully. A heat-treated tool for impact extrusion of articles from nonferrous metals was introduced at the Minsk production association imeni V. I. Lenin and the production association "Gorizont"; heat-treated friction materials for centers of friction in road machines are being applied at the Mogilev auto factory and the Minsk "Udarnik" factory; heat-treated filter materials for filtration of melted spinning material and control of suspension quality, at the Mogilev production association "Khimvolokno" imeni V. I. Lenin; filter elements of titanium powder for sewage treatment, at the Novopolotsk petroleum refining plant; heat-treated metallic forms, at the Minsk porcelain factory. Articles made of new materials have been introduced at "Belpromenergo," the Minsk motor factory, the "Gomsel'mash" plant, and at other enterprises. In all, 17 developments from the Scientific-research Institute of Powder Metallurgy have been introduced into production at enterprises of the republic in just the past year. Their utilization provides a saving of over 4.5 million rubles a year.

Every year, the ministry, together with higher educational institutions, forwards proposals to the Belorussian Gosplan and the economic ministries and agencies of the republic for the organization of experimental-production tests and for utilization of the results of completed scientific-research work appropriate for one or more branches of the economy. After the review of these materials at sessions of scientific-technical councils for branches of the economy, with participation by scientists, measures are determined for the utilization of the proposed developments and corresponding tasks are put into the plan for scientific-research work and for introduction of new technology. Proposals for the utilization of scientific-research work are sent to Belorussian Gosplan for inclusion in the State Plan for the Economic and Social Development of the Belorussian SSR.

In 1979 alone, the Belorussian Ministry of Higher and Secondary Specialized Education sent 29 proposals for review by 25 interested ministries, agencies, and enterprises of branches of the economy and of union significance; 18 of those proposals became obligatory for both the VUZ's responsible for their fulfillment and for the enterprises.

Many of the developments of VUZ's adopted for series production have important economic significance. Thus, scientists of the Belorussian Technological Institute imeni S. M. Kirov, together with the Novopolotsk division of the "Plastpolimir" scientific-production association, created and introduced a self-extinguishing polyolefin composition into production at the Novopolotsk "Polimir" production association and the Gur'yevskiy chemical plant. At the Belorussian University imeni V. I. Lenin, projects are in progress on improving and creating new measuring devices and apparatuses. A new receiving-recording system developed here is being utilized in the production of the atomic absorption spectrophotometer SA-9, which is distinguished for its high rate of productivity, for high precision in measurement, and for its increased simplicity and numerical display which, together with a high degree of automation of the measurement process, make it very easy to use.

In the microelectronics department of the Minsk Institute of Radio Engineering, research and development has been completed on a low-temperature electrolytic process for making integrated circuits. As a result, technological processes were developed and introduced at the "Integral" production association that permitted the solution of a number of urgent problems in raising the level of integration in large-scale integrated circuits, in particular, the forming of elements measuring under two micromicrons. For this work, the authors' collective (of which the scientific director was doctor of engineering sciences V. A. Labunov) was awarded last year a first prize of the Presidium of the USSR Academy of Sciences "For the Best Work in the Field of Electronics."

New tires for the guiding wheels for tractors of the "Belarus" family were created and introduced into production by the industrial scientific-research laboratory for general-purpose cultivator wheeled tractors of the Belorussian Polytechnical Institute (scientific director was doctor of technical sciences V. V. Gus'kov) jointly with the Minsk tractor plant, the Dnepropetrovsk branch of the Scientific Research Institute of the Tire Industry, and other organizations. The total real economic effect from utilizing the new tires on series tractors was over 30 million rubles.

It must be stated that far from all industrial enterprises and economic ministries show enlightened interest in VUZ innovations, even when these innovations have been proven in other enterprises. Thus, for example, the Minsk automobile factory delayed introduction of explosive-hardened components for mechanical forge presses, the hardening technology for which was developed by the Scientific-research Institute for Powder Metallurgy of the Belorussian Polytechnical Institute. And these components have more durability by a factor of 5 to 6 than the series type: evidence for this is the experience of the Minsk tractor factory and the Minsk gear factory.

And this is not an isolated case. Many instances are explained by the fact that a number of VUZ developments that could be introduced successfully are not included in plans for new technology either by branches of the economy or by enterprises. Also insufficient are measures for the material and psychological encouragement for innovation. Therefore, it would be advisable to develop a system whereby the questions of experimental-industrial trials and the introduction of the results would be decided already at the stage when applied scientific research is planned and the tasks would be included in plans for new technology for enterprises.

It seems that, in republic plans for introducing the results of completed scientific research work and also in programs in work for introducing new types of products, it is necessary to affirm the responsibilities of those ministries and agencies, enterprises, and organizations that will use the developments. Such an approach will increase the responsibility both of the developer and of the user for the fate of innovations and will hasten their introduction into the economy.

Fulfilling the decisions of the party and government and the instructions of the General Secretary of the CPSU Central Committee and Chairman of the Presidium of the USSR Supreme Soviet Comrade L. I. Brezhnev on questions of scientific development and strengthening its influence on all aspects of life in Soviet society, higher schools of the republic in recent years have definitely done much for the improvement of planning and coordination of scientific-research and experimental-design work, for the development of material resources, and for the strengthening of cooperation between science and production. However, as was noted at the 19th plenum of the Belorussian Communist Party Central Committee by candidate member of the Politburo of the CPSU Central Committee and first secretary of the Central Committee of the Belorussian Communist Party Comrade P. M. Masherov, it is assumed to be only the beginning of a large-scale, complicated job, tied with the increasing contribution of the republic in the solution of problems of historic importance presented by the party--the uniting of the achievements of the scientific-technical revolution with the advantages of socialism.

This instruction greatly obligates the scientists, the post-graduate students, and the undergraduates of our VUZ's: organizing scientific activity more efficiently and searching harder for ways to have more effective influence on the development of the economy and to improve the management mechanism--these are everyday concerns. They are a matter of honor.

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IMPROVING COST ACCOUNTING IN SCIENTIFIC RESEARCH ORGANIZATIONS

MINSK PROMYSHLENNOST' BELORUSSII in Russian No 12, 1979 pp 35-36

[Article by V. Khryapchenkov, dotsent and candidate of economic sciences: "Problems of Scientific-Technical Progress: Putting Scientific Research on a Cost-Accounting Basis"]

[Text] One of the most important means for raising the effectiveness of production is the further expansion of fundamental research and the concentration of the efforts and attention of scientists on the most important trends in scientific-technical progress. The solution of all these problem questions largely depends on economic stimulation of work in scientific-research organizations, but also on the creation of large scientific-production associations with scientific-research, design, and planning-technological organizations, and with experimental and series manufacturing by industrial enterprises.

Let us begin with the latter. The advantages of the scientific-production association are shown by practice. In our republic, particularly, the ideal organizational structure has taken root as a production-technical association--a complex which associates industrial enterprises, planning-design, and, in individual cases, scientific-research organizations; it has a single production and economic task for the organization of the output and supply of modern products to the economy. The production-technical association framework eliminates such stages of work as the transfer of documentation from one organization to another and the preparation and testing of adjustment batches, providing significant shortening of the "research-production" cycle. In our republic there has been wide development of joint councils of enterprises and scientific institutions, joint scientific-technical conferences, development and research on production problems on the basis of two-way socialist agreements between scientists and production workers, and complex brigades for the introduction of new technology. All of this has a substantial influence on shortening the time necessary for introducing scientific-technical achievements into production.

has, for example, practically every enterprise in the republic maintains (long-term contacts) with scientific-research institutes and higher educational institutions. All this, of course, is gratifying. The problem of perfecting the system for stimulating the work of scientists, however, cannot be solved by the establishment of such social relations. The solution is the perfecting of khozraschet [cost accounting] as the most important element of centralized control of science and as a method of stimulating scientific progress.

The peculiarities of khozraschet in science are determined by the specifics of creative labor, by the individual character of research and development, and by the complications of determining (for individual types) normative levels of expenses. Khozraschet, as is known, assumes the use of a limited quantity of plan indicators and the organization of precise and objective estimates of their level and the application of a clear system of financial stimulation based on comparison of expenses with the results achieved. In addition, it is closely related to elements of the economic mechanism for controlling production--planning, pricing, credit, and so forth. As for the control aspect of the khozraschet problem, it is first of all linked with the estimation of its activity, effectiveness, and degree of completeness.

Experience shows that khozraschet activity and its purposefulness are determined to a significant degree also by the selection of the plan indicators used for evaluating the work of scientific-research organizations. Therefore, it is more expedient, in our opinion, to plan the following indicators: a listing of work topics and stages by length of periods for completion; general volume of self-initiated scientific research work expressed in money terms; labor productivity; general salary fund, including the salary fund for the support staff; sum total of profit of economic effectiveness from the realization of developments; profitability; general size of centralized capital investments; volume of construction and assembly work, and the activation of production capacity and basic resources. All of these must be approved by high-level organizations. Other indicators (number of workers by category, average salaries, the cost of work being performed per topic, and so forth) are being developed by the organizations themselves and serve as supplementary material for compiling work-topic plans.

Thus, khozraschet in scientific-research organizations presupposes that all expenditures connected with the fulfillment of scientific-research, experimental-design, and planning-technological work be fully covered by revenues from the sponsors and that they create the necessary planned accumulation for developing their own production base and creation of necessary funds for economic stimulation. The financing of work by these organizations is accomplished at the expense of budget allocations, the sponsors' funds for assimilation of new technology, and other sources.

A number of enterprises of the republic have accumulated considerable experience with this plan. Many of them apply intraministerial systems for planning scientific-technical developments and their introduction into production on the basis of order-commissions. These systems are being tested for work being financed from the unified fund for development of science and technology for the whole period--from scientific exploratory research to the preparation of prototypes for new items or the application of new technology.

Along with the technical requirements, an order-commission shows all of the performers and coexecutors for the work as well as the organizations providing the financing. As a result, in one document are concentrated the necessary systematic indicators which characterize scientific-research development.

The necessity has arisen for broadening the experiment in financing scientific research, experimental-design, and planning-technological work and also expenditures related to the assimilation and introduction of newly created types of production from a single source--a centralized fund for the development of science and technology. At the same time, wider use should be made of bank credit for these purposes and granting it to ministries and agencies. Bank credit as a supplementary source of financing can take a significant place in the system for financing scientific research, experimental-design, and planning-technological work, especially in those cases where an additional requirement arises for means to conduct short-term measures for assimilation or innovation work not included in the plan and in cases where such measures are fulfilled ahead of plan.

The rational organization of khozraschet in scientific-research organizations to a significant degree depends also on the system of financial stimulation. Funds for financial encouragement, for social-cultural measures, and for housing construction for scientific-research organizations are created from part of the receipts from the actual effect (profit) received by scientific organizations as a result of the utilization of their developments in industrial production and from means included in the estimated cost of scientific-technical developments and of work on creating prototypes of new technology for which the economic effectiveness cannot be established.

Sources of funds for financial encouragement, in addition, include revenues for bonuses from centralized funds and reserves of high-level organizations and also awards for concrete projects and developments. The fund for development is created out of planned accumulations from fulfilling economic agreements or intraministerial orders, and also out of cash realized from selling unnecessary or unneeded equipment. The condition for forming funds for economic stimulation is the fulfillment of the work-topic plan and other technical-economic indicators.

The planned sizes of bonuses for forming economic stimulation funds must be approved by high level organizations for five years (laid out by year) simultaneously with approval of plans for the conduct of the corresponding research, developments, and plans for their realization (plans for assimilation of new technology, products, etc.) in the various branches of the economy. Along with this, the establishment of a uniform scientific based scale of bonuses has important significance.

Along with the perfection of economic stimulation, the problem of financial responsibility of scientific research organizations for the quality of work being fulfilled has considerable significance. Financial responsibility means providing reimbursement to the sponsor for current losses arising in connection with defects in design or other work and also responsibility for scientific-technical organizations for the quality of their research and development. At the present time, reimbursement is usually limited to the payment of a forfeit of 5 percent of the value of the planned work.

With the introduction of full-scale khozraschet, fundamental significance would be attached to the financial responsibility of scientific research organizations for nonfulfillment of accepted obligations for guaranteed or technical solutions, for economic indicators, and for performance periods. In those cases where commitments with guaranteed effect are not provided, an organization that concludes an agreement must reimburse the sponsor for actual losses.

The problem of strengthening and perfecting the organization of khozraschet within an institute requires its own solution. Here, more urgency is attached to questions of planning khozraschet indicators for structural subdivisions; to the provision of actual day-to-day control and operational systems analysis; the establishment of an effective system for financial encouragement of scientific collectives for the final results of research and development, and the application of khozraschet principles in mutual relations between structural subdivisions and the administration of a scientific organization.

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GEORGIAN AS GENERAL MEETING CHANGES STATUTE, ELECTS NEW VICE-PRESIDENTS

Tbilisi ZARYA VOSTOKA in Russian 13 Apr 80 p 2

[GRUZINFORM report: "In Key Directions: Annual General Meeting of the Georgian Academy of Sciences"]

[Text] Each year the scientific-technical potential of the republic grows stronger. Effective utilization of powerful research resources, better matching of science with economic questions, the strengthening of creative relations with industrial enterprises, increase in the proportion of research and development having applied significance--this is the chief direction of activity of Georgian scientists in the fourth year of the tenth five-year plan.

At the annual general meeting of the Georgian Academy of Sciences in Tbilisi, discussions took place on various aspects of fundamental and applied research in 1979 by scientists of the republic in all fields of natural, technical and social sciences; on how they are preparing for the 110th anniversary of V. I. Lenin's birthday and the 35th anniversary of the Great Victory of the Soviet People over Fascist Germany; and on preparations for the 26th CPSU Congress and the 26th Congress of the Georgian Communist Party.

The presidium of the assembly included Secretary of the Georgian Communist Party Central Committee G. Yenukidze, head of the department for science and educational institutions of the Georgian Communist Party Central Committee E. Sekhniashvili, and managers of the republic Academy of Sciences.

The assembly was opened by the President of the Georgian Academy of Sciences Ye. Kharadze.

Participants in the meeting observed a minute of silence in memory of Georgian Academy of Sciences academicians M. Sabashvili, V. Gulisashvili, I. Pipiya, F. Davitaya, and P. Gamkrelidze, and corresponding member V. Khutsishvili.

Meeting participants heard with great interest a report by [illegible] and [illegible] corresponding member of the Georgian Academy of Sciences L. Gorgiladze.

Then an announcement was made concerning the presentation of a Georgian Academy of Sciences award imeni I. Dzhavakhishvili for the best scientific work in 1979 in the field of history. This award was made to Doctor of Historical Sciences Ya. Kikvidze (posthumously) for research on "Agriculture and Its Cult in Ancient Georgia."

Medals and awards of the republic Academy of Sciences were also given to students of higher educational institutions and to young scientists for outstanding scientific work done in 1979. They were presented to the younger scientific associate at the Institute of Physics of the republic Academy of Sciences A. Ushveridze for a cycle of work on the "Study of the Spectrum of Classic Solutions in Certain Field Theory Models"; to fifth-year female student at Tbilisi State University [illegible] for the scholarly work, "The Georgian Version of the Psalms and Balahvar Wisdom;" to fourth-year student at Tbilisi State University [illegible] for the scholarly work, "The Newspapers 'Sakartvelos Moambe' and 'Sakartvelos [illegible]' as Important Primary Sources for Understanding British Politics in the Transcaucasus and Near East (1918-1920)."

Academician-Secretary of the republic Academy of Sciences [illegible] gave a report, "The Activities of the Georgian Academy of Sciences in 1979."

The following took part in the discussion of the report: [illegible], director of the Institute of Economics and Law and an academician of the Georgian Academy of Sciences; V. Makhaldiani, academician-secretary of the Department of Applied Mechanics and Control Processes of the republic Academy of Sciences; A. Dzidziguri, chairman of the commission for the study of the productive forces and natural resources and an academician of the Georgian Academy of Sciences; N. Khazaradze, secretary of the party organization of the Institute of History, Archeology, and Ethnography imeni I. Dzhavakhishvili of the Georgian Academy of Sciences and a candidate of historical sciences; [illegible], deputy director for the scientific section of the Institute of Metallurgy imeni the 50th Year of the USSR and a corresponding member of the Georgian Academy of Sciences; and B. Tekhov, director of the Yugo-Osetinskiy Scientific Research Institute of the Georgian Academy of Sciences and a doctor of historical sciences.

In the report and in the speeches it was noted that the activity of the Georgian Academy of Sciences and its institutions in 1979 was directed toward transforming into life the decisions of the 25th CPSU Congress and the 25th Georgian Communist Party Congress, of succeeding plenums and decrees of the CPSU Central Committee and the Georgian Communist Party Central Committee and toward fulfilling the tasks placed before Soviet scientists in the writings and speeches of the general secretary of the CPSU Central Committee and Chairman of the Presidium of the USSR Supreme Soviet Comrade L. I. Brezhnev.

The assembly noted that the reporting period was characterized by increased attention by the Academy of Sciences toward the solution of key economic problems. Scientific-research institutions and each associate of the Academy have considered and continue to consider their first obligation to be the further improvement in the quality of scientific-research work and the effectiveness of scientific developments.

Basic research works having great scientific and economic repercussions during the reporting period were referred to at the meeting.

During the reporting period, the creative relations between Georgian scientists and central scientific institutions and organizations and union-republic academies of sciences were broadened, and scientific and scientific-production relations with scientists of the socialist countries were strengthened. Many examples were given at the meeting of fruitful cooperation by the republic Academy of Sciences with other academies of this country and with foreign academies.

Detailed discussions took place at the meeting concerning the concrete work of many institutes and organizations of the Georgian Academy of Sciences. It was noted that characteristic of each of them was the trend toward research work more closely related to life and to practice.

The general assembly approved changes in the charter of the Georgian Academy of Sciences. In particular, henceforth elections of new active and corresponding members of the Georgian Academy of Sciences will take place every two years instead of every four years as it did previously.

The assembly examined organizational questions.

Academician I. Gverdtsiteli and G. Dzhibladze of the republic Academy of Sciences were elected vice-presidents of the Georgian Academy of Sciences.

Academician A. Tsagareli of the Georgian Academy of Sciences was elected academician-secretary of the Department of Earth Sciences of the Georgian Academy of Sciences. Academician T. Oniani of the republic Academy of Sciences was elected academician-secretary of the Department of Physiology and Experimental Medicine. Corresponding member A. Apakidze of the Georgian Academy of Sciences was designated to carry out the duties of academician-secretary for the Department of Social Sciences. Academician G. Dzhidzhava of the Georgian Academy of Sciences was elected a member of the presidium of the republic Academy of Sciences.

The general meeting of the Georgian Academy of Sciences confirmed the directors of scientific-research establishments.

The annual general meeting of the Georgian Academy of Sciences adopted a decree in which concrete measures were spelled out for further improvement of scientific research of both fundamental and applied character and for the fulfillment of obligations undertaken by Georgian scientists for 1980. The decree stresses the necessity for concentrating the efforts of Georgian scientists on scientific directions which are important for the development of key branches of industry, construction, and agriculture.

8645
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ARMENIAN PLANNING OFFICIAL SUGGESTS R&D 'COORDINATING BODY'

Yerevan KOMMUNIST in Russian 30 Apr 80 p 2

[Article by G. Khachatryan, professor and doctor of economic sciences, director of the Armenian branch of the Scientific Research Institute of Planning and Norms of USSR Gosplan: "The Degree of Efficiency, Administration: Science and Practice"]

[Text] Production association managers have been striving persistently in recent years to develop their own scientific and design base. This demand of technical process could only have been welcomed. But is this trend always justified by necessity? I don't think so. It is frequently an extraordinary reaction to inadequate or ineffective interaction between plant specialists and solid, reliable institutes or a consequence of bureaucratic barriers which are difficult to surmount.

Why should we have to lay siege to other agencies and go running cap in hand to other ministries? It would be better and more convenient simply to set up our own institute and combine the efforts of science and production within the framework of a single enterprise. So goes the manager's reasoning.

But what we are trying to do is to look at the matter from the point of view of an entire region. Take Armenia, for example. Approximately 30,000 people are at work in the scientific research institutes, special design offices and the laboratories of the higher educational institutions here. Basically what this means is that there is now one scientific research organization or design office for every five of the republic's industrial collectives. But how are we exploiting this great scientific and technical potential? Final production results give us no cause for satisfaction.

Everybody knows that collaboration between scientists and plant specialists is more effective where the most advanced innovations are proposed for introduction into production operations. Over the past three years, for example, all products developed by the All-Union Scientific Research Institute of Complex Electrical Equipment and introduced into production operations by the Armelektromash association have been awarded the government's Seal of Quality. And there are no few good examples of this. But here is the alarming thing. Ever since the beginning of the Tenth Five-Year Plan, only 30-40 per cent of the innovations developed by our research institutions have been accepted for practical introduction into production operations. The annual economic gain achieved from the introduction of each innovation amounts to an average of 3[illegible],000 rubles. So the following conclusion suggests itself: our numerous scientific organizations are still producing an insufficient impact upon practical production operations, their efforts achieving only a low level of efficiency. Why?

Here is what was turned up by analysis of the state of the scientific support provided two of our leading industries. The All-Union Scientific Research Institute of Complex Electrical Equipment and branches of the All-Union scientific research institutes of electrical engineering and of the cable industry all have operations in the republic. At the same time, large production associations like Armelektrosvet and Armelektroapparat remain outside the sphere of attraction of these electro-technical institutes, which, of course, has an impact upon their production levels. And here's another example. More than 1400 people work in the seven scientific institutions and organizations operating under the authority of the Ministry of the Chemical Industry of the USSR. At the same time, 1450 other specialists are working in the same area in the five institutes and laboratories of the Armenian Academy of Sciences. But our chemists, alas, cannot boast of any successes.

Many large enterprises--tire, industrial rubber and other plants--have no scientific support within the region. Half of the innovations in this area developed by scientific suborganizations of the electrotechnical and chemical industries are designed for introduction beyond the borders of the republic. At the same time, half of the materials and products of these industries are cured in facilities located in other economic regions. Is this right? Hardly.

We are also disturbed by the fact that the scientific organizations located within Armenia of even a single industry are making no attempt to develop a common technical policy taking the interests of the republic's economic development into consideration. How can this incohesiveness, this lack of coordination be overcome? One of the possible ways of increasing our effective yield from this scientific-technical potential is to organize centralized scientific support for production operations in accordance with a territorial principle. In our view, it would be more efficient and to greater advantage to have local enterprises specialize on the basis of the areas of specialization of existing scientific institutions rather than to establish all new institutes with their networks of branch facilities.

The view has so far prevailed that the interests of the development of production operations, their level and their scales dictate the establishment of scientific institutions. This approach was an entirely natural one to adopt, inasmuch as at one time our scientific base lagged behind our industrial production base. But the opposite is now becoming ever more frequently the case. Industrial enterprises are frequently unable to keep up with the pace of scientific-technical advances, which restrains the introduction of more efficient innovations. This means that the relations between the partners should be reorganized. Let science always be the one to point the way for industrial operational practice.

In studying the matter of the impact of scientific advances upon industrial production, we came to the conclusion that bureaucratic barriers prevent many institutes from achieving the necessary degree of interactions. At the same time, a comprehensive, integrated approach to the solution of problems and creative collaboration on the part of research institutions of allied industries achieve the highest degree of efficiency. New ideas and the best ways to realize them may be developed more rapidly in the context of a joint effort. But enterprise scientific organizations are still commonly accommodating themselves to local production problems. And the fact also is that far from all personnel are receiving the necessary specialized training.

One of the primary reasons for the low level of effectiveness characterizing our scientific potential lies in the fact that many technological, organizational and other problems, all of which are essentially similar in nature, are being worked on in parallel in a number of institutes and laboratories. Bureaucratic uncoordination and incohesiveness prevent the Armenian Academy of Sciences from being able effectively to coordinate and organize the complex research being conducted within the republic. No little unnecessary time is consumed in efforts to overcome difficulties and in carrying out experimental design work. I think that a cost-accounting system governing organization of the production, development and introduction of new technology in accordance with supply orders (contracts) should comprise the basis for the modes and methods of collaboration between industry, territorial and scientific-technical centers on the one hand and industrial enterprises in the various regions on the other. These centers could establish their own intraorganizational system of cooperation and lines of specialization. It would be to advantage to make primary institutes responsible for methodological direction in the case of major problems. A coordinating authority would, of course, have to be set up to insure efficient planning and control of scientific research and development efforts in the various regions. As we know, an arrangement like this in the Ukraine has entirely justified itself.

Centralized direction of the scientific research conducted in the various regions would make possible successful accomplishment of the tasks set forth in the decree of the CPSU Central Committee and the USSR Council of

Ministers on improving our economic administrative mechanism. We believe that we should begin now with a thorough analysis of the scientific-technical level and the technical-economic parameters of the industrial production within the various economic regions and the development of a sound long-term plan for the development and manufacture of new types of products. Secondly, scientific research plans should coincide as closely as possible with those types of products whose mass production within the republic or region can be introduced within the shortest possible periods of time.

The system of scientific research and development should not only take into consideration the specific nature and characteristics of the scientific work involved, along with trends in scientific and technological development, but also be at the same time a moving force in the development of regional productive capacities. The results and effectiveness of our scientific labors will then increase sharply.

8963
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GEORGIAN OFFICIAL ON PUTTING SCIENCE INTO PRODUCTION

Tbilisi KOMUNISTI in Georgian 4 Jun 80 p 1

[GSSR State Committee for Science and Technology Chairman and GSSR Academy of Sciences Vice President I. Gverdtsiteli under rubric "Science Into Production!": "Creative Association"]

> [Text] The collectives of a number of the republic's scientific institutions, production associations, and industrial enterprises launched an important initiative. In honor of the 110th anniversary of the birth of V. I. Lenin they pledged in 1980 to speed up the introduction of economically vital scientific-technical developments into production.
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> At the request of the Gruzinform correspondent, GSSR State Committee for Science and Technology Chairman and GSSR Academy of Sciences Vice President I. Gverdtsiteli commented on the first results of this creative collaboration between production workers and scientists.

At the present stage of economic development, accelerated scientific-technical progress is still a prime task. In his address to the 25th CPSU Congress, Comrade L. I. Brezhnev noted that today the practical introduction of new scientific ideas is just as important as working them out.

Resolving the tasks mapped out at the 25th CPSU Congress requires an accelerated pace of raising the technical level of basic production sectors through the practical introduction of scientific-technical advances.

Because of this, it is very important to strengthen creative relationships between the collectives of the scientific-research institutes, design bureaus, and industrial enterprises.

The Georgian Agricultural Mechanization and Electrification Scientific-Research Institute and the engineering-technical staff, workers, and employees of Gruzsel'khoztekhnika's Digomi Experimental Repair Plant jointly decided to modify 100 T-25-A tractors one month before the haying season in the mountains.

The collective of the Caucasian Minerals Institute, the Gruzgornokhimprom Production Association's Makharadze Mining Administration, and the republic Light Industry Ministry's Zugdidi Porcelain Plant jointly pledged to develop a technology ahead of schedule for enriching the bentonite clay wastes of the Askani Deposit for use in the porcelain industry. This will enable us to do without scarce materials which until now had to be brought in from distant regions of the country.

Tbilisi's Gruzsel'mashina Plant has close contacts with the scientists of Gornosel'mashina All-Union Scientific-Research Institute. The scientists and production workers pledged to prepare two test samples of a mechanized tea picking machine before the time stipulated in plan targets and to implement other projects designed to conserve metal in the manufacture of tea bush pruning equipment.

The goal of further perfecting progressive forms of scientific and production integration such as creative collaboration between the industrial enterprises and the research-project and design organizations is necessitated by many factors, especially the need to step up the pace of introduction of scientific advances into the national economy.

A most vital thrust in scientific-technical progress is the introduction of the kinds of advanced technological processes which will enable us to substantially reduce material and labor outlays, ensure integrated processing of raw materials, and enhance the end economic effect.

As an example of successful creative collaboration between scientists and production workers, serving to step up the pace of social labor productivity growth, we can cite the joint efforts of the GSSR Academy of Sciences Physical and Organic Chemistry, Inorganic Chemistry, and Electrochemistry institutes and the Madneuli Mining-Concentration Combine. They completed modernization of the autoclave-hydrometallurgical installation ahead of schedule.

Grape farmers have been helped a great deal by the Rtveli-78 and Rtveli-79 automated control systems introduced in Telavskiy and Kvarelskiy rayons. Other rayons in the republic have also decided to borrow this experience. The automated control system is the result of the joint creative efforts of the Georgian affiliate of the All-Union Scientific-Research Institute of Organization and Control Problems of the USSR State Committee for Science and Technology, the GSSR Central Statistical Administration, the GSSR Ministry of Agriculture, and the Telavskiy and Kvarelskiy rayon agricultural administrations. The successful introduction of the Rtveli automated control system into production was facilitated by the fact that the raykoms spearheaded all organizational and practical work.

Scientific-technical progress is called upon to resolve the vital economic and social task of mechanizing and automating production processes. Substantial successes have been achieved in this regard in recent years. The power-to-labor ratio in industry has almost doubled in the past ten years. And the number of integrated-mechanized plants has almost tripled in that period.

Nevertheless, the level of manual labor remains too high. Equipment for mechanizing loading-unloading, hoisting, and transport operations is not being introduced fast enough in a number of sectors, and too many workers are being employed in these operations. Contacts between science and production, and the introduction of joint projects, can help to speed up the mechanization and automation of production processes, reduce the level of manual labor, and improve safety conditions.

It is essential now to strengthen ties between science and production and accelerate the start-up of new facilities being created on the basis of advanced production technologies.

Georgia's scientists, who are responding in deed to the party's call to make this final year of the five-year plan a year of shock labor and Leninist style of work, will make a worthy contribution to the further intensification of production, accelerated scientific-technical progress, and perfection of the economic mechanism.

We are confident that the important initiative of the collectives of the scientific institutions, production associations, and industrial enterprises will spread widely in the republic, because the interaction of this form helps to stimulate the introduction of scientific findings into practice.

Wherever the party committees take charge of the complex process of introducing new techniques into the national economy, success is assured.

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